

AN EXPLORATION OF COGNITIVE AND NON-COGNITIVE SKILLS RELEVANT
TO ENTREPRENEURIAL BEHAVIOR WITHIN A VIDEO GAME ENVIRONMENT

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By

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ABSTRACT

This qualitative, empirical study explored the cognitive and non-cognitive skills relevant to entrepreneurship exhibited by students as they played a simulation type video game known as Capitalism Lab. Entrepreneurship education programs and video games for learning have been and continue to be implemented all over the world as nations compete in a global economy. The use of entrepreneurship education programs and video games for learning influences the entrepreneurial knowledge, intent, and skills of the students who partake in them. While the application of cognitive and non-cognitive skills has been found to have a positive relationship with both student development and their long-term economic outcomes seems to be supported, the connection of cognitive/non-cognitive skills to specific entrepreneurship skills was unclear. The primary methods for data collection used in this study were 1) participant observation completed through reviewing screen capture recordings of Capitalism Lab gameplay and 2) semi-structured interviews. This study examined the in-game behaviours of six students as they individually played Capitalism Lab. The main goal was to seek insight into the cognitive and non-cognitive skills leveraged by the student while they played the game and how these skills may be related to areas of entrepreneurial skill. Connections were found between the cognitive and non-cognitive skills and entrepreneurial minds. The information gathered in this study may serve as a basis for further research into the investigation, development, and refinement of how the cognitive and non-cognitive skills related to entrepreneurship are exercised as students play video games.

Keywords: cognitive skills, non-cognitive skills, entrepreneurship education, video games

CHAPTER 1

BACKGROUND AND NEED FOR THE STUDY

The successful development of skilled entrepreneurs and employees is crucial for the economic prosperity of any nation (Schumpeter 1911; Audretsch & Thurik 2001; Audretsch & Keilbach 2004; Acs, Desai & Hessels 2008). Sharpened cognitive and non-cognitive skills (also called “soft skills”) are valuable for both new and experienced entrepreneurs, established employers, and employees. The cognitive and non-cognitive skills relevant to entrepreneurship that students exhibit as they play a simulation-type video game are currently unexplored. There is limited research connecting cognitive and non-cognitive skills to skills/traits that are commonly identified amongst entrepreneurs.

For this study, the game Capitalism Lab¹ was chosen. The goal of this game is to create businesses and compete against the computer players to generate the most profit. The number of options available within the game through various combinations of different products (more than 80 individual items can be sold) and business types (more than 10) that players can utilize is extensive. The game also keeps track of not only the player’s businesses, but also what the computer is doing at a detailed level. The player has access to a wide variety of data about both their businesses and the computer player’s businesses including information relevant to real entrepreneurs outside of the game. Examples of this information include both net worth and income statements.

¹ More information on the specifics of Capitalism Lab including images and how to play can be found at <https://www.capitalismlab.com>

1.1 Theoretical Framework

The underlying philosophical basis of this study is pragmatism. According to Driscoll (2005) pragmatism lies somewhere between objectivism and interpretivism. Barnes (2008) wrote a summary of the viewpoints of prominent pragmatists such as John Dewey, Oliver Wendell Holmes, William James, Charles Sander Peirce, Richard Rorty, Richard Bernstein, and Richard Shusterman, which stated that “pragmatists believed that indubitable epistemological foundations neither existed or were necessary” (p. 1545). In this article, Barnes (2008) also identified that pragmatists believe knowledge is socially constructed and that ideas must be considered pliable or adaptable as the world changes. Pragmatists pursue repeated experimentation and pluralism in order to produce ideas and results that offer the most utility for the real-world context, identifying that it is important that data is collected and interpreted for a purpose, but that the purpose itself can be adjusted based on the context of the society that the research is conducted in. Pragmatism was an appropriate choice for this study because it is concerned with describing the cognitive and non-cognitive skills behind entrepreneurial behavior in a specific context.

This thesis also draws upon Gardner’s (2008) theory of the five minds for the future: the disciplined, synthesizing, creating, respectful and ethical minds. He (2008) defines the *disciplined mind* where an individual pursues mastery, the *synthesizing mind* as incorporating knowledge from multiple disciplines, the *creating mind* as crafting new knowledge, the *respectful mind* as valuing diversity, and the *ethical mind* as a commitment to high standards of socially acceptable behaviour for both an individual and their work. Gardner’s (2008) position is that individuals in the future must strive to pursue their own development in all five of these areas.

Duening (2010) applies Gardner’s previous theory of the five minds specifically to the discipline of entrepreneurship. He (2010) identifies cognitive skills that fall into five categories that he calls the five minds for entrepreneurship. These five minds are known as the opportunity-

recognition, designing, risk-management, resilient, and effectuating minds. Though the term “cognitive skills” is used by Duening (2010), many of the skills identified within this framework seem to be better conceptualized as a combination of *both* cognitive and non-cognitive skills because of the strong interrelationships between cognitive and non-cognitive skills. This study examines each of the five minds as areas where both cognitive and non-cognitive skills may be simultaneously exhibited by the participants in this study.

As part of a literature review for UNESCO, Zhou (2016) defines non-cognitive skills as being associated with attitudes, motivations, and personal characteristics. Non-cognitive skills, also known as soft skills, are related to motivation, confidence, tenacity, trustworthiness, perseverance, social, and communication skills. Referring to Zhou’s 2016 report to differentiate cognitive skills from non-cognitive skills, Pierre, Sanchez-Puerta, Valerio, and Rajadel (2014) define cognitive skills as the “ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, [and] to overcome obstacles by taking thought” (p. 2). Specific cognitive and non-cognitive skills are discussed in further detail in Chapter 2, the literature review.

Based on a synthesis of research on the process of entrepreneurial learning, Politis (2005) identifies that opportunity-recognition and the ability to cope with the *liability of newness* (i.e. being unfamiliar with a skill or topic handicaps one’s ability to perform well in that area) are among the foremost skills that entrepreneurs must possess. Politis (2005) further identifies that coping with this liability of newness includes the entrepreneurs’ ability to act and be flexible in the face of ambiguity, to manage risks to the business, and persist through failure. There are strong links between the characteristics of entrepreneurial learning identified by Politis (2005)

and Duening's (2010) theory of the five minds for the opportunity-recognition, risk management, resilient and effectuating minds.

As part of a literature review on the influence of non-cognitive skills on outcomes for students, Gutman and Schoon (2013) argue "that there are strong associations between non-cognitive skills and positive outcomes for young people" (p. 43). However, they (2013) also identify that there is no single non-cognitive skill that is more important than any other and that these skills must be considered in tandem, rather than individually. The non-cognitive skills investigated in Gutman and Schoon's (2013) review are included as Figure 1.1.1, where the skills are ranked based on the quality of measurement (what tests/methods are generally used to measure the skill and their validity), malleability (whether it can be learned or developed), effect on other outcomes (size/impact of the effect in experimental or empirical studies) and the strength of the evidence (how many experimental/empirical studies have been done) that supports them based on other studies. Figure 1.1.1 categorizes these four areas based on whether studies were not available or contained no evidence, or if a low, medium or high amount of evidence was present. Hypothetically entrepreneurs synthesize and apply whatever knowledge they possess to tackle problems regardless of the discipline in which the knowledge originated, applying both cognitive and non-cognitive skills as necessary to solve problems related to their goal. Based on these studies (Gutman & Schoon, 2013; Politis, 2005; Zhou, 2016), it is reasonable to focus on both types of skills applied simultaneously under the umbrella of each of Duening's five minds.

Figure 1.1.1

Screenshot of summary of findings on non-cognitive skills (Gutman and Schoon, 2013). Re-printed with permission (permission granted in Appendix A).

	Quality of measurement	Malleability	Effect on other outcomes	Strength of Evidence
1. Self-Perceptions				
Self-Concept of Ability	High	Medium	Not available	Medium
Self-Efficacy	High	High	High	Medium
2. Motivation				
Achievement Goal Theory	High	Medium	Low to medium	Medium
Intrinsic Motivation	High	Medium	Low to medium	High
Expectancy-Value Theory	Medium	Not available	Medium to high	Medium
3. Perseverance				
Engagement	Medium	Not available	Not available	Low
Grit	Medium	No evidence	No evidence	Low
4. Self-Control	Medium	Low to medium	Low	Medium
5. Meta-Cognition	Medium	Medium to high	Medium to high	High
6. Social Competencies				
Leadership Skills	Low	Not available	No evidence	Low
Social Skills	Medium	Medium to high	Low to medium	High
7. Resilience and Coping	Medium	High	Low	Medium
8. Creativity	Medium	Not available	No evidence	Low

This work by Politis (2005) and Gutman and Schoon (2013) further supports the choice of Duening’s five minds for entrepreneurship as the theoretical framework of this study: most of the non-cognitive skills identified by Gutman and Schoon (2013) appear analogous to the minds from the chosen framework. Therefore, looking at the five minds as areas where cognitive and non-cognitive skills are applied is a worthwhile approach.

1.2 Statement of the Problem

Although one can reasonably assume that cognitive and non-cognitive skills are innately tied to a person's ability to succeed as an entrepreneur, it is not known which specific cognitive and non-cognitive skills relevant to entrepreneurship can be developed by playing video games or if these skills are enacted at all during gaming activity. Prior to determining if these skills can be developed or refined using video games, it is first necessary to determine which cognitive and non-cognitive skills relevant to entrepreneurship *are exhibited* by students as they play a simulation-type video game. The focus of this study will be on examining evidence of applied cognitive/non-cognitive skills (i.e., their behavior within the game) within entrepreneurial minds as Capitalism Lab is played.

1.3 Research Question

What cognitive and non-cognitive skills and behaviors relevant to entrepreneurship do students exhibit while playing Capitalism Lab?

1.4 Description of the Study

For this study, a small group of six Grade 11/12 students from a rural school in Saskatchewan was asked to play Capitalism Lab. Capitalism Lab is a game where students simulate the operation of a business to make as much profit as possible as they compete against the computer. The participants completed a short questionnaire about their entrepreneurship qualities and tendencies then played the game for around thirty minutes. The participants had some time for training (i.e., all the participants played the game's tutorial) and then a set time limit to play the game. A screen recording of their game performance was recorded, and the participants

answered questions in a face-to-face interview after their time limit for gameplay expired. The environment for them to play the game was set up in advance in a private room.

1.5 Delimitations

Despite the sample size being small, a large amount of data was generated for each student which made it necessary to limit the number of participants. For geographic practicality, one location (a single high school) was selected. Computers and recording equipment for the study were transported to the site where the data was collected. Since the study was done with students who were actively participating in their regular courses, restricting the participation to a single school was also done to minimize the impact of the study on the students' regular activities as well as school administration and facilities.

Each area of Duening's (2010) five minds is an area where students exhibit a combination of cognitive and non-cognitive skills. In this study, no attempt is made to determine the influence of video games on individual cognitive and non-cognitive skills or to determine which cognitive and non-cognitive skills influence each other. This investigation will be left for future research once evidence for links between entrepreneurial minds and the cognitive and non-cognitive skills has been observed.

1.6 Definitions

Entrepreneurship - is "a reiterative process of personal evaluating, planning, acting and reassessing which encourages people to take on the responsibility for creation and innovation" (Cunningham & Lischeron, 1991, p. 57). This is done with the intent to start an **enterprise**, which is defined as "a project undertaken or to be undertaken, especially one that is important or difficult or that requires boldness or energy" (p. 2). Notably, this definition for entrepreneurship

places emphasis on entrepreneurship as a process which creates economic and/or social value to society.

Entrepreneur - As part of a thorough literature review, Filion (2021) starts by defining an entrepreneur as someone who at least is “an actor who innovates by recognizing opportunities; he or she makes moderately risky decisions that lead into actions requiring the efficient use of resources and contributing an added value” (p. 78). Filion also identified six specific qualities (discussed in the literature review) of an entrepreneur but goes on to say that a complete definition of an entrepreneur is not currently available. While there seems to be a lack of consistently accepted definitions of who and what entrepreneurs are, it is commonly acknowledged there are different stages or levels of being an entrepreneur (likely coinciding with the different stages of the entrepreneurship process), and these can vary based on the discipline or industry in which the entrepreneur is working. It is also apparent that entrepreneurs draw on whatever skills they possess to tackle problems. Filion’s partial definition of an entrepreneur is supported by Cunningham and Lischerons’ (1991) previous views of entrepreneurship as a process.

Capitalism Lab - the simulation game that has been chosen is dynamic, where choices that both the player and the computer make impact how the player interacts with the game. The goal of Capitalism Lab is to make as much profit as possible by starting and operating businesses. The game does not model the entire entrepreneurial process. The missing parts of the process have little if any impact on the study as Capitalism Lab was not originally intended to be used to teach the entrepreneurial process. Rather, this study is focused on the entrepreneurial behavior of the player as they play the game and the cognitive and non-cognitive skills associated with that behavior.

Educational video games - In a literature review, De Freitas (2006) defines **educational video games** as “applications using the characteristics of video and computer games to create engaging and immersive learning experiences for delivering specified learning goals, outcomes and experiences” (p. 10) that involve a series of choices made by the user. De Freitas (2006) also defines **simulations** as “a way of modeling a real-world situation on a computer” (p. 10) and as a type of video game. The researcher recognizes that Capitalism Lab is a game that was not specifically designed for educational use but believes it needs to be noted that the game is used academically by both secondary and post-secondary institutions in North America, including some previous use at both Stanford and Harvard universities for teaching business and entrepreneurship.

Five minds for entrepreneurship - The five minds for entrepreneurship theory is derived from Duening (2010) and identifies certain areas of thinking (opportunity-recognition, designing, risk managing, resilient, and effectuating minds) as relevant to entrepreneurship and entrepreneurial behavior. The process that resulted in the definitions here is discussed in more detail as part of the literature review and theoretical framework:

- The **opportunity recognition mind** is the ability to recognize an opportunity that can be exploited.
- The **designing mind** is the “need to combine disparate ideas, people or physical objects in novel ways that appeal to others” (Duening, 2010, p. 16).
- The **risk managing mind** is the “ability, emotionally, to manage perceived risk and the ability to reduce actual risk through specific actions” (Duening, 2010, p. 17).
- The **resilient mind** is the capacity for coping with the strong emotions associated with potentially repeated failure.

- The **effectuating mind** is the ability to take “action in a world of uncertain and often unpredictable outcomes” (Duening, 2010, p. 18).

Non-cognitive skills - A definition for non-cognitive skills is discussed using previous research by Bjorklund-Young (2016) but no concrete definition has been accepted in the literature. Additionally, she (2016) indicates that “the specific set of skills referenced [as non-cognitive skills] depends on the field of study.” (p. 1) For this study, non-cognitive skills are defined as “the collection of socio-emotional and behavioral skills relevant to performance on tasks and interpersonal interactions.” There are also several important definitions of specific non-cognitive skills that were required for this thesis. Perseverance/grit, self-control and social skills have reasonably well agreed upon definitions in the literature.

- **Perseverance/grit** - Shechtman et al. (2013) define perseverance/grit as pursuing “long term or higher order goals in the face of challenges and setbacks, engaging the student’s psychological resources, such as their academic mind sets, effortful control, and strategies and tactics” (p. 3).
- **Self-control** - Baumeister, Vohs, and Tice, (2007) define self-control as the “capacity for altering one’s own responses, especially to bring them into line with standards such as ideals, values, morals and social expectations, and to support the pursuit of long-term goals” (p. 5).
- **Social skills** - Welsh and Bierman (1998) define social skills as “an individual’s knowledge of and ability to use appropriate social behaviors that are pleasing to others in interpersonal situations” (p. 7).

The other definitions of non-cognitive skills used in this study have been operationalized. More detail on how these definitions were determined is included in the literature review.

The definitions themselves are provided here:

- **Resilience and coping** - the management of emotions during the process of adapting to challenging circumstances while working to complete difficult tasks.
- **Self-perception** - a person's concept of their own abilities and beliefs about their own capability to influence their circumstances.
- **Creativity** - the production of a product, [*plan, or service*] that is novel and useful in a social context, based on the individual or group's aptitudes, processes and operating environment (adapted from Plucker, Beghetto and Gow, 2004).
- **Metacognition** - the knowledge of and ability to regulate and monitor one's own cognitive processes before, during and after tasks.
- **Motivation** - the performance of an activity for either the inherent pleasure or an external reward that results from performing the activity.

Cognitive skills – While reviewing the literature it is difficult to find a concrete definition for cognitive skills; however, Liu (2003) describes cognitive skills as “mental skills [that are] broadly ranged from memory skills to procedural skills, from language skills to reasoning skills” (p. 1). The researcher also needed to operationalize definitions for specific cognitive skills because good evidence of agreement on definitions for them was not found in the literature. The cognitive skills used in this study have operationalized as:

- **Sustained attention** - the ability to examine, focus on and think about tasks over a period of time based on the context of the task and motivation for completing it.

- **Response inhibition** - the ability to prevent or stop a response to distractions.
- **Speed of information processing** – the speed with which a learner can process new information and act upon it.
- **Cognitive flexibility and control** - the ability to quickly redirect cognitive resources to approach a new situation.
- **Multiple simultaneous attention** - the ability to direct attention towards, redirect attention between and complete two or more tasks at the same time.
- **Working memory** - the ability to direct attention to keep, process and use information in a short period of time to perform tasks.
- **Category formation** - the ability to organize information, concepts and skills into categories either unconsciously or through a deliberate process in order to simplify processing of stimuli in the environment.
- **Pattern recognition** – the ability to identify similar properties among disparate objects to form patterns that are relevant and useful to the current context by applying previous knowledge.

1.7 Summary

This study will investigate the research question of “What cognitive and non-cognitive skills and behaviors relevant to entrepreneurship do students exhibit while playing Capitalism Lab?” Using a philosophically pragmatic approach and the theoretical framework derived from Duening’s work, Duening’s five minds for entrepreneurship theory will be applied to survey results, interviews and video footage of students playing Capitalism Lab. The students’ entrepreneurial behavior within the game will then be examined using the definitions for the cognitive and non-cognitive skills. In Chapter 2 the research on cognitive and non-cognitive skills, video

games, and entrepreneurship are examined to establish the research space for this study as well as confirm that the study design is valid for observing applications of cognitive and non-cognitive skills. Chapter 3 provides a description of the methods and methodology. Chapter 4 reports the results of the survey, observations, and interviews. Chapter 5 discusses the cognitive and non-cognitive skills related to entrepreneurship. Chapter 6 features the conclusions, contributions, and recommendations for further study.

CHAPTER 2

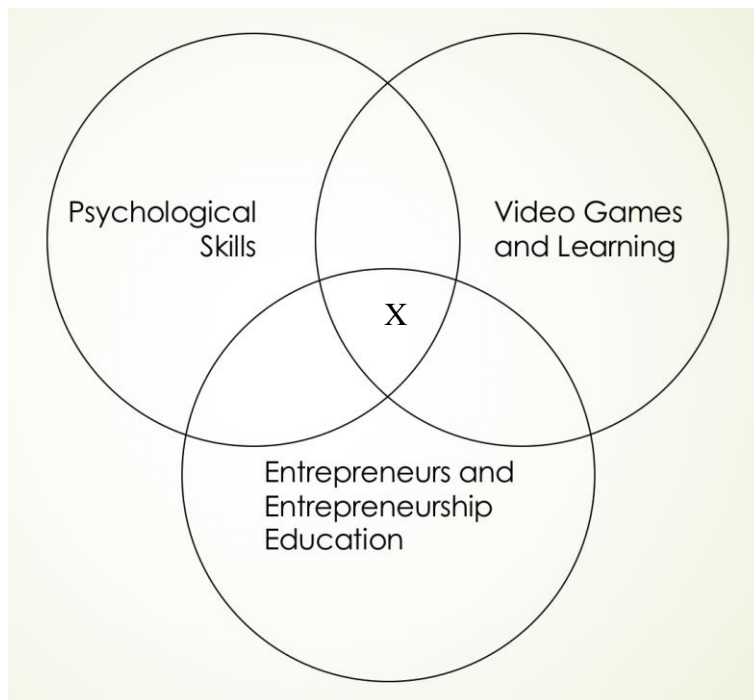
LITERATURE REVIEW

2.1 The Research Space

This thesis draws from three separate areas of literature and their intersections: entrepreneurs and entrepreneurship education, video games for learning, and psychological skills research. In this literature review, a general overview of each of the areas is investigated then summarized. These summaries provide context for discussing the regions where these research areas overlap (see Figure 2.1.1); hence, that the research space is represented by the intersection of all three areas (the central region of Figure 2.1.1 marked with a X).

Figure 2.1.1

Venn diagram of the research space.



2.2 Experiential Learning and Learning Entrepreneurship

Jamieson (1984) categorizes entrepreneurship education into three categories: education *about* enterprise, *for* enterprise, and *in* enterprise. Education about enterprise primarily addresses how to set up and run a business from a theoretical perspective *without* taking action towards starting a business. Education *for* enterprise addresses actively setting up and running a business, usually culminating in the creation of a business plan that *could be* implemented to begin a business. Education *in* enterprise is focused on management training which provides more specific skills to entrepreneurs who have *already begun* their organizations and need to learn to advance to the next stage of growth. The three-pronged approach described by Jamieson (1984) supports the education of entrepreneurs at different stages in the process of entrepreneurship.

Timmons et al. (1987) noted that there is a limit to what students can learn in entrepreneurship education programs and indicated that starting an entrepreneurial enterprise provides educational experiences for the entrepreneur that cannot be learned in a simulated program. Synthesis of research done by Politis (2005) indicates that entrepreneurial learning must be experiential. Politis (2005) also argued that this learning is primarily influenced by the entrepreneurs' individual career experiences, their ability to transform these experiences into applicable knowledge and their capacity for coping with the pressures of starting a new venture. Garris, Ahlers, and Driskell (2002) note that experiential learning is "paired with appropriate learner support for effective learning to occur [and] learning by doing must be coupled with the opportunity to reflect and abstract relevant information for effective learning" (p. 455). So, are entrepreneurship education programs ineffective?

At first glance, learning to become an entrepreneur seems too complex to be taught in an entrepreneurship education program. Yet, Henry, Hill, and Leitch (2005) conclude that "at least some aspects of entrepreneurship can successfully be taught" (p. 98). Their view that parts of the

entrepreneurship process can be taught is corroborated by Kuratko (2005) through a review of previous literature. Kuratko (2005) also identifies challenges facing entrepreneurship education programs and a wide range of pedagogical techniques that are focused on experiential learning while emphasizing the importance of these techniques on entrepreneurship education. This experiential component of entrepreneurship education is also supported by Williams' (2011) assessment of business simulations as useful learning tools. Woolfolk-Ruiz and Acosta-Alvarado (2016) also argued that placing students in situations where they could develop their abilities was necessary because they determined that experiential learning activities contributed to entrepreneurial learning. Kolb's (1984) perspective also suggests that experiential learning is a process where the learner creates knowledge based on their experience. Further support comes from Gentry (1990) who indicates that experiential learning is "participative, interactive, and applied" (p. 20). Through examining and combining the research on experiential learning with the research on entrepreneurial learning, it is plausible to conceptualize entrepreneurial learning as an experiential learning process. Although part of being an entrepreneur seems to be learned through experience as an entrepreneur, there are a multitude of organized, formal entrepreneurial education programs for students who aspire to become entrepreneurs.

2.3 The Effects of Entrepreneurship Education Programs

There are a substantial number of entrepreneurship education programs all over the globe. Therefore, one might ask whether these programs build students' entrepreneurial skills. And, if so, how? In a longitudinal study of the effects of entrepreneurship education Elert, Andersson, and Wennberg (2014) tracked entrepreneurial outcomes of nearly 10,000 high school students. They (2014) concluded that by participating in an entrepreneurship education program, students increased their probability of starting a firm as well as increased their incomes while

operating the firm. Entrepreneurial education programs have also been run with younger students prior to high school. Huber, Sloof, and Praag (2014) evaluated a similar program run with 11 and 12-year-old students called BizWorld. Bizworld was utilized in 85 schools with 2751 students and across this sample they observed that the program had positive effects on students' non-cognitive entrepreneurial skills. In their (2014) study, these non-cognitive entrepreneurial skills included risk taking, creativity, need for achievement, self-efficacy, social orientation, pro-activity, persistence, as well as the ability to analyze situations and motivate others. These studies suggest that there are parallels between Duening's five minds and the cognitive and non-cognitive skills identified in Chapter 1 and justifies the choice of the non-cognitive skills that will be investigated in this study.

It should be noted that Shinnar, Hsu, and Powell (2014) argue that the gender of the students partaking in entrepreneurship education programs must be considered when judging the impact of the educational program on aspiring entrepreneur's skills and intent. Their (2014) study found that "entrepreneurship education had a more positive effect on the male students than on their female counterparts. Consequently, [they suggested that] male students may be more positively influenced by a semester-long class to pursue an entrepreneurial career" (p. 567). Furthermore, Shinnar, Hsu, and Powell (2014) also speculate that the female students in the study may have perceived entrepreneurial careers as a poor fit even though they may have been equally competent in entrepreneurial skills as their male colleagues. It can also be inferred from their (2014) study that some of the people (male or female) who would be good candidates for entrepreneurship will choose not to pursue it because of their own self-perception of their entrepreneurial abilities. It is noted that several of the non-cognitive skills (for example, motivation and self-perception) already seem to play a role in influencing whether a student decides to

pursue entrepreneurship. Although it would be valuable to society if the people with strong entrepreneurial skills pursue entrepreneurship as a career, society also needs employees that support established businesses.

Graevenitz, Harhoff, and Weber (2010) argue that partaking in entrepreneurship education contributes to identifying students who are not likely to succeed as entrepreneurs. This self-selection provides a benefit for society even from relatively short entrepreneurship education programs. Students who are less suited to tackling the challenges of entrepreneurship may choose to avoid entrepreneurship because of their participation in the entrepreneurship education program. Those who are better suited to the unique challenges involved in entrepreneurship may pursue additional entrepreneurial opportunities, which may help improve the success rate of new enterprises. To further illustrate, Oosterbeek, van Praag, and Ijsselstein (2010) as well as Huber, Sloof, and Praag (2014) also concluded that entrepreneurial intent could be negatively impacted by participating in entrepreneurship education programs among some high school and university students. In these studies, this negative impact on intent was suspected to have stemmed from the students' realization that they lacked the skills or motivation to run a business and, therefore, they chose not to pursue entrepreneurship as a future career. Overall, this possible negative impact on entrepreneurial intent is potentially a positive benefit for society as it would allow society to focus resources on developing those who want to become entrepreneurs while allowing those less suited for entrepreneurship to pursue other careers.

Martin, McNally, and Kay (2013) performed a meta-analysis of the literature. Based on their results, they concluded that increased entrepreneurship skills/knowledge and intent as well as improvement of perceptions of entrepreneurship were linked with entrepreneurship education and training. They (2013) were also able to show that entrepreneurship education programs

contribute to the overall performance of entrepreneurs as they start up and manage enterprises. Based on a series of interviews, Elmuti, Khoury, and Omran (2012) indicate that entrepreneurship education programs have a positive impact on the effectiveness of entrepreneurs when they operate their own organizations (for-profit businesses or non-profit enterprises). Based on this evidence, it is reasonable to argue that entrepreneurship education programs provide benefits for society and can improve the entrepreneurial outcomes of students who partake in them. One can infer from this that 1) entrepreneurship programs are associated with higher entrepreneurial outcomes and 2) that they appear to facilitate the acquisition of individual skills and traits related to entrepreneurship. For this reason, there is a good probability that the skills and traits relevant to entrepreneurship can be learned and developed in these programs. But what are these skills and traits?

2.4 Entrepreneurs and Entrepreneurship Traits and Skills

Given the importance of entrepreneurship within society, the general character traits possessed by entrepreneurs have been and continue to be of interest. Ibrahim and Soufani (2002) reviewed a multitude of Canadian entrepreneurship education programs from universities, colleges, federal and provincial small business centers, the Business Development Bank of Canada, major Canadian banks, and a variety of other organizations to identify the characteristics that successful entrepreneurs possess. They (2002) determined that successful entrepreneurs in Canada have traits including a high need for achievement and independence, an internal locus of control, a high tolerance for ambiguity, and the ability to innovate.

Filion (1999) provides a more specific definition of the characteristics and traits generally associated with or possessed by entrepreneurs around the world which include: “aggressiveness, high energy level, self-confidence, self-awareness, self-esteem, learning ability, ability to take

moderate risks, ability to innovate, leadership, ability to recognize opportunities and make the right decisions, creativity, energy, flexibility, skill in the use of resources, ability to conduct situations, independence, initiative, independence and success oriented, results oriented, originality, optimism, persistence, sensibility to others, tenacity, tendency to trust people, tendency to regard money as a performance measure, and tolerance to ambiguity and uncertainty” (p. 5). While more detailed, Filion’s (1999) definition is supported by the research done by Ibrahim and Soufani (2002). Baum (2015) dissects the entrepreneurial mind and how entrepreneurs perceive themselves and their development in relation to society endorsing the idea that entrepreneurs have a keen eye for spotting opportunities. Furthermore Baum (2015) argues that the ability and desire to solve problems is important to shaping the way entrepreneurs think. There are parallels between these studies (Baum, 2015; Filion, 1999; Ibrahim & Soufani, 2002) and Duening’s five minds along with the cognitive and non-cognitive skills selected for this study.

As discussed previously in the theoretical framework part of Chapter 1, Duening (2010) applied Gardner’s theory of the five minds to entrepreneurship and developed a framework based on the areas of skill that entrepreneurs possess. These areas of entrepreneurial skill are classified as the opportunity-recognizing mind, the designing mind, the risk-managing mind, the resilient mind and the effectuating mind. The opportunity-recognizing mind is almost self-explanatory: “The recognition of opportunity [that can be exploited] is essential to entrepreneurship. It is a skill that develops over time in most entrepreneurs, suggesting that it is a skill that can be learned and refined” (Duening, 2010, p. 15). The designing mind is slightly different, defining “the need to combine disparate ideas, people or physical objects in novel ways that appeal to others” (Duening, 2010, p. 16). The designing mind is also relevant to both short and long-term planning as well as problem solving. The risk-managing mind applies “the ability, emotionally, to manage

perceived risk and the ability to reduce actual risk through specific actions” (Duening, 2010, p. 17). The resilient mind focuses on the capacity for coping with the strong emotions associated with potentially repeated failure. Finally, competence within the effectuating mind allows “taking action in a world of uncertain and often unpredictable outcomes” (Duening, 2010, p. 18). Duening (2010) further expands on these by identifying the pedagogical implications for curricular development based on these five minds. This study argues as well that these areas of entrepreneurial skill are linked to both cognitive and non-cognitive skills simultaneously.

Situations where these minds can be improved and refined seem to happen for entrepreneurs as part of their experience working in the field as well as through formal entrepreneurship education programs. For example, Corbett (2005) argues that an entrepreneur’s previous knowledge affects their ability to identify opportunities that can be exploited, which in turn affects their ability to perform as an entrepreneur. This opportunity-recognition mind may be developed through the entrepreneur’s experience, indicating that the cognitive and non-cognitive skills that underlie the opportunity-recognition mind are potentially learned as part of this experiential process. However, before determining whether video games can be leveraged within entrepreneurship education programs to train these skills or how these skills can be developed, it is first necessary to examine and operationalize the definitions of these cognitive and non-cognitive skills.

2.5 Defining Non-Cognitive Skills

Although no concrete definition has been accepted in the literature, Bjorklund-Young (2016) suggests that “the specific set of skills referenced [as non-cognitive skills] depends on the field of study” (p. 1). For this study, non-cognitive skills are defined as the collection of socio-emotional and behavioral skills relevant to performance on tasks and interpersonal interactions.

The non-cognitive skills that will be investigated include self-perception, motivation, perseverance/grit, self-control, metacognition, social skills, resiliency and coping, and creativity; as per Zhou's (2016) literature review. According to his (2016) report, the "operational definitions are not clear for self-perception of ability (self-perception), motivation, metacognitive strategies (metacognition), resilience and coping as well as creativity" (p. 3). While this is unfortunate, there are academic definitions from the literature for perseverance/grit, self-control, and social skills. Shechtman et al. (2013) define **perseverance/grit** as pursuing "long term or higher order goals in the face of challenges and setbacks, engaging the student's psychological resources, such as their academic mind sets, effortful control, and strategies and tactics" (p. 3). Baumeister, Vohs, and Tice, (2007) define **self-control** as the "capacity for altering one's own responses, especially to bring them into line with standards such as ideals, values, morals and social expectations, and to support the pursuit of long-term goals" (p. 5). Welsh and Bierman (1998) define **social skills** as "an individual's knowledge of and ability to use appropriate social behaviors that are pleasing to others in interpersonal situations" (p. 7). It is worth noting that in Huber, Sloof, and Praag's (2014) study, they classify several of these non-cognitive skills (creativity, motivation, self-efficacy, social orientation, and persistence) as being entrepreneurial skills.

Since academic definitions lack agreement for five of the eight non-cognitive skills, an attempt is made here to provide working definitions for this study based on previous literature. The non-cognitive skill of resilience and coping can be partially defined using a definition of persistence by Ventura, Shute, and Zhao (2013): "a facet of conscientiousness that reflects a dispositional need [to] complete difficult tasks, and the desire to exhibit high standards of performance in the face of frustration" (p. 52). Another common definition in the literature that helps define this skill is Masten, Best, and Garmezy's (1990) definition of resilience as "the process of,

capacity for, or outcome of successful adaptation despite challenging or threatening circumstances” (p. 426). Coping is also a part of this non-cognitive skill. Compas, Malcarne, and Fondacaro (1988) distinguish between two types of coping: problem-focused and emotion-focused. They (1988) defined problem-focused coping as “efforts to act on the source of stress” (p. 1), while emotion-focused coping is defined as “efforts to regulate emotional states associated with or [as a] result from stressful events” (p. 1). For this study, the non-cognitive skill of **resilience and coping** is defined as the management of emotions during the process of adapting to challenging circumstances while working to complete difficult tasks.

Gutman and Schoon (2013) have divided self-perception into two areas: self-perception of ability and self-efficacy. Self-perception of ability is also called self-concept of ability, and is defined by Pesu, Viljaranta, and Aunola (2016) as “an individual’s perception of his or her competence in a certain domain” (p. 63). Self-efficacy is defined by Bandura (1993) as “people’s beliefs about their own capabilities to exercise control over their own level of functioning and over events that affect their lives” (p. 118). Self-efficacy can be dependent on a student’s individual skill in specific areas (Schunk, 1991). Based on these previous definitions this study defines **self-perception** as a person’s concept of their own abilities and beliefs about their own capability to influence their circumstances.

In a review of literature on the definition of creativity, Plucker, Beghetto, and Gow (2004) define creativity as “the interaction between aptitude, process and environment by which an individual or group produces a perceptible product that is both novel and useful as defined in a social context” (p. 90). However, in their (2004) study they also note that a definition of creativity is not agreed upon in the literature and that researchers who explore creativity must establish a clear definition in their studies. In this study, **creativity** is defined using Plucker et al.’s

(2004) definition with a slight modification, as the production of a product, [*plan, or service*] that is novel and useful in a social context, based on the individual or group's aptitudes, processes and operating environment.

Metacognition is often simply described as thinking about thinking, but there still is no commonly agreed upon definition. Flavell (1979) originally discussed metacognition as monitoring memory, comprehension, and other cognitive enterprises. He (1979) also divided metacognition into the knowledge, experiences, goals, and strategies that a person applies when thinking. Livingston (2003) indicates that metacognition is often used interchangeably with self-regulation or meta-memory, and that metacognition emphasizes "the role of executive processes in the overseeing and regulation of cognitive processes" (p. 2). Hacker, Dunlosky, and Graesser (1998) argue that any "definition of metacognition should include at least these notions: knowledge of one's knowledge, processes and cognitive and affective states; and the ability to consciously and deliberately monitor and regulate one's knowledge, processes and cognitive and affective states" (p. 11). For this study, **metacognition** is defined as the knowledge of and ability to regulate and monitor one's own cognitive processes before, during and after tasks.

Ryan and Deci (2000) claimed that motivation is often split into "*intrinsic motivation*, which refers to doing something because it is inherently interesting or enjoyable, and *extrinsic motivation*, which refers to doing something because it leads to a separable outcome" (p. 55) such as making money to buy something. Reiss (2004) also indicates that "people are motivated to engage in activities they expect to experience as pleasurable" (p. 182). Teo, Lim, and Lai (1999) present alternate definitions of intrinsic and extrinsic motivation, with intrinsic motivation being "the performance of an activity for no apparent reinforcement other than the process of performing the activity" and extrinsic motivation being "the performance of an activity because

it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself” (p. 26). For this study, **motivation** is defined as the performance of an activity for either the inherent pleasure or an external reward that results from performing the activity.

2.6 Defining Cognitive Skills

Reviewing the literature shows that it is difficult to find a single concrete definition for cognitive skills, however Liu (2003) describes cognitive skills as “mental skills [that are] broadly ranged from memory skills to procedural skills, from language skills to reasoning skills” (p. 1). The eight cognitive skills that will be investigated include: sustained attention, response inhibition, speed of information processing, cognitive flexibility and control, multiple simultaneous attention, working memory, category formation, and pattern recognition/reasoning. Plain language definitions for these sections were initially obtained from C8 Science² led by Dr. Bruce Wexler, a Professor Emeritus at Yale who studied cognitive neuroscience and who reviewed the literature to operationalize definitions for these cognitive skills that are utilized to communicate with the public. Additional literature was examined for each of these cognitive skills to operationalize definitions for this study.

Based on his review of the literature, Wexler (n.d.) describes sustained attention as the ability to examine, focus on and think about tasks over a time interval. Barkley (1997) describes sustained attention based on a definition of persistence, which the researcher notes is also used to define the non-cognitive skill of resilience and coping. Barkley (1997) states that sustained attention is either contingency-based or self-regulated and goal-directed. The difference between the two types of sustained attention is described as context dependent (contingency-based) or self-

² See <https://www.c8sciences.com> for more information.

dependent (self-regulated and goal-directed). Mirsky et al. (1991) defines sustained attention as “the capacity to maintain focus and alertness over time, or vigilance” (p. 112). For this study, **sustained attention** is defined as the ability to examine, focus on, and think about tasks over a period of time based on the context of the task and motivation for completing it.

Wexler (n.d.) defines response inhibition as the ability to prevent a reaction to distractions. Albert, Lopez-Martin, and Carretie (2010) define response inhibition as “the ability to suppress inappropriate thoughts and actions” (p. 914). Wright et al. (2014) indicate that response inhibition is simply “the ability to withhold a response” (p. 429) but identify that there are many underlying processes that either prevent action from being taken or stop action shortly after beginning to act that are part of response inhibition. For this study, **response inhibition** is defined as the ability to prevent or stop a response to distractions.

According to Wexler (n.d.), speed of information processing refers to how swiftly a learner processes new information. Jacobson, Geist, and Mahone (2018) suggest that speed of information processing includes both the time for cognitive processing and the time for a motor response. Interestingly, the researchers noted that several articles they reviewed that discussed cognitive processing speed seemed to choose not to precisely define what the term means. This indicates that perhaps the definition applied is exactly what the term sounds like it is describing: how fast an individual can understand information they encounter. For this study, **speed of information processing** is defined as how quickly a learner can process new information and act upon it.

Wexler (n.d.) discusses cognitive flexibility and control as the cognitive skill that allows a person to adapt and change their mind when they encounter a new situation. Darby, Castro,

Wasserman, and Sloutsky (2018) define cognitive flexibility as “the ability to efficiently adapt to changing task demands” (p. 30). Braem and Egner (2018) indicate that cognitive flexibility is one part of cognitive control and define it as the “ability to quickly reconfigure [their] mind and switch between different tasks” (p. 470). Laureiro-Martinez and Brusoni (2018) define cognitive flexibility as “the ability to match the type of cognitive processing with the type of problem at hand” (p. 1032). For this study, **cognitive flexibility and control** is defined as the ability to quickly redirect cognitive resources to approach a new situation. For example, a strong enemy appears while your character is being attacked by a large group of weak enemies (what will your new strategy be?) would require use of cognitive flexibility and control.

Regarding multitasking, Wexler (n.d.) describes multiple simultaneous attention as the ability to direct attention towards and engage with two or more tasks at the same time. Rothbart and Posner (2015) define multitasking as “aligning one’s attention with alternating sources of sensory input” (p. 43). Szumowska and Kossowska (2017) indicate that multitasking is characterized by “those who can effectively divide their attention between several ongoing tasks” (p. 272). Buser and Peter (2012) specify that multitasking happens when a person switches between two tasks but differentiate this from task switching where attention is redirected. For this study, **multiple simultaneous attention** is defined as the ability to direct attention towards, redirect attention between and complete two or more tasks at the same time. For example, a strong enemy appears while you are halfway through solving a timed puzzle would require use of multiple simultaneous attention to survive.

Based on his review of the literature, Wexler (n.d.) explains working memory as remembering instructions for a sufficient amount of time to perform tasks involving those instructions.

Lazar (2017) defines working memory as “the ability to transiently keep, process, and use information as part of ongoing mental processes” (p. 197). Shipstead, Redick, and Engle (2012) differentiate between short-term memory and working memory: short-term memory refers to the storage of information for replication or reproduction while working memory refers to the storage of information then directing attention towards a task that requires use of that information (which includes decision making or reasoning). Ricker, Nieuwenstein, Bayliss, and Barrouillet (2018) also identify the important role that attention has with regard to working memory. Driscoll (2005) indicates that working memory generally lasts anywhere from fifteen to thirty seconds. For this study, **working memory** is defined as the ability to direct attention to keep, process and use information in a short period of time to perform tasks. For example, remembering a short sequence of numbers before dialing a phone number.

Wexler (n.d.) describes category formation as the ability to sort new or previously encountered information, concepts, and skills into pre-existing or newly generated categories. Rosch (1978) indicates that categorization helps a person to reduce the differences between stimuli to amounts that can be easily used while also allowing the person to perceive structure within the world around them. Rosch (1978) also suggests that categorization allows the processing of a large amount of information while using minimal cognitive resources to do so. Gastgeb et al. (2012) identify that “the ability to form a prototype is a critical skill for category learning, because it decreases memory load and allows individuals to store an average representation of experienced items rather than needing to store every item in memory. It is also an example of implicit learning in that it is an automatic process; people form prototypes without any outside instruction, effort, or awareness” (p. 1695). They (2012) also identified that if a category is simple, it requires less effort to form than a complex category, but the individual creates the category by

exerting cognitive resources. For this study, **category formation** is defined as the ability to organize information, concepts, and skills into categories either unconsciously or through a deliberate process to simplify processing of stimuli in the environment. For example, grouping enemies as strong or weak to devise a strategy for a specific encounter in a video game.

Based on his review of the literature, Wexler (n.d.) defines pattern recognition as finding patterns and being able to logically predict their consequences based on the pattern itself. Pattern recognition is discussed by de Paiva (2011) as the process of identifying similar properties of different objects but notes that there are differences among disciplines that discuss pattern recognition among what properties are identified to form a pattern. For example, de Paiva (2011) specifies in psychology that behavioral patterns are used to define pattern recognition, while in mathematics it might be computational or visual patterns. Bilalic, Langner, Erb, and Grodd (2010) indicate that pattern recognition is a complex process that depends on object recognition and is rooted in a person's previous knowledge. For this study, **pattern recognition** is defined as identifying similar properties among disparate objects to form patterns that are relevant and useful to the current context by applying previous knowledge. For example, recognizing that a specific arrangement of enemies constitutes a specific attack pattern in a game so the player can counter it.

Each area of Duening's (2010) five minds is an area where students exhibit a combination of cognitive and non-cognitive skills. In this study, no attempt is made to determine the influence of video games on individual cognitive and non-cognitive skills or to determine which cognitive and non-cognitive skills influence each other. This investigation will be left for future research once evidence for links between entrepreneurial minds and the cognitive and non-cognitive skills has been observed.

2.7 Cognitive and Non-Cognitive Skill Development

In his discussion of experiential learning, Kolb (1984) differentiates between performance, learning and development by temporal characteristics: *performance* is short-term while *learning and development* is long term. This suggests that the development of cognitive and non-cognitive skills can be considered a long-term experiential learning process. Cunha and Heckman (2007) claim that while cognitive and non-cognitive skills are formed consistently throughout a child's development, the development of cognitive skills improves non-cognitive skills (and vice versa), and that skills (regardless of whether they are cognitive or non-cognitive) learned earlier augment skills learned later in life. Unfortunately, Zhou (2016) claims that there is a "lack of solid evidence showing which soft skills, to what extent, [and] in what situation [are] most predictive of academic and workforce outcomes" (p. 10) which will impact the assessment of these skills. Zhou's (2016) claim is unsurprising given that many of these cognitive and non-cognitive skills lacked agreed-upon definitions in the literature. Kautz et al. (2014) argue that widely used "achievement tests like the GED [General Educational Development] do not adequately capture valuable non-cognitive skills" (p. 2) yet they acknowledge that both cognitive and non-cognitive skills can be impacted by factors such as family environment, wealth, and parental education. Crucially, Kautz et al. (2014) clearly indicate that non-cognitive skills can be improved and developed throughout life. Authors in the field of psychology known as skill theory indicate that cognitive skills have distinct substages of development (Anderson; 1982). Furthermore, Fischer (1980) suggests that cognitive skills are developed throughout a person's life. Potential future research on how to develop cognitive and non-cognitive skills for entrepreneurship within simulation type video games may be possible, but it is necessary to first examine the overlap between video games, entrepreneurial learning, and cognitive/non-cognitive skills.

2.8 Entrepreneurship and Non-Cognitive Skills

Previously in the literature review, entrepreneurial traits were discussed but direct relationships between entrepreneurship and non-cognitive skills were not reviewed. Amongst the majority of this research, general conclusions are reached about specific non-cognitive skills and their relationship to entrepreneurship. There are a few smaller examples of how a specific non-cognitive skill helps the entrepreneur, but there is a research gap here. This study aims to narrow down how these non-cognitive skills serve the entrepreneur in the entrepreneurial process.

At first glance, perseverance/grit seems to play a role in entrepreneurship, but there are other factors at play. Arco-Tirado, Bojica, Fernandez-Martin, and Hoyle (2019) identified that while grit plays a role in entrepreneurship, individuals “who are better equipped to capitalize on grit are the ones who have more resources” (p. 9). This indicates that the supports that a person has in place affect how much grit someone possess as well as the amount that a potential entrepreneur can exploit an opportunity or take advantage of a market gap. Mooradian, Matzler, Uzelac, and Bauer (2016) have also identified links between grit and entrepreneurial success, with increased grit corresponding to increased entrepreneurial success, but exactly how and why grit contributes to the entrepreneurial minds is not clear. So, while some research has been done linking grit and entrepreneurship, more research is needed.

Self-control seems to be important for entrepreneurs, but its role is not clear either. Geldthof et al. (2014) identified a relationship between self-control and entrepreneurship, particularly entrepreneurial intent. They also confirmed a gender gap in entrepreneurial intent with males being significantly more likely to pursue entrepreneurship than females. One of their more interesting findings was that “self-regulation skills may help place individuals on entrepreneurial life trajectories well before they undertake any actual entrepreneurship endeavors” (p. 89). The

existence of a relationship between self-control and entrepreneurial intent was also investigated by Aditya (2020), who further solidifies that self-control plays a role for entrepreneurs.

Social skills seem to have a crucial role in entrepreneurship, with Baron (2000) indicating that “successful entrepreneurs appear to be [high] in social competence – the ability to interact effectively with others” (p. 15). Baron and Markman (2000) indicate that social capital is important for providing access to specific people that will be important to the success of an entrepreneurial venture, however Baron and Markman (2003) indicate that it is social competencies that determine entrepreneurial success. It is clear that social skills play a role in entrepreneurial outcomes.

Resilience and coping have been previously linked with entrepreneurship. As part of a literature review, Korber and McNaughton (2018) examined both the positive and negative effects of resiliency at the individual, organizational, environmental and social levels on entrepreneurship consequences. Duchek (2018) indicates the link between resilience and entrepreneurship stems from “the positive impact of a respectful and supportive family background” (p. 447). Corner, Pavlovich, and Singh (2017) investigated links between resilience and entrepreneurship as well as how entrepreneurs cope following the failure of an entrepreneurial venture. Interestingly, Korber and McNaughton (2018) also found links between resilience and several other traits/skills including: coping ability, risk mitigation, self-efficacy, optimism, adaptive capacity, and persistence. Lee and Wang (2017) also identify links between entrepreneurial resilience and other traits/skills including: self-efficacy, motivation, and persistence. It seems clear that not only is resilience and coping linked to entrepreneurship somehow, but that it is also connected to other non-cognitive skills in some way.

Self-perception is related to entrepreneurship as well. Gutman and Schoon (2013) have divided self-perception into two areas: self-perception of ability and self-efficacy. Both Korber and McNaughton (2018) as well as Lee and Wang (2017) indicate that links exist between entrepreneurial resilience and self-efficacy. Ceresia and Mendola (2020) showed that “entrepreneurial self-identity is a strong and significant predictor of EI [entrepreneurial intent]” (p. 9). It seems clear that some connection exists between self-perception and entrepreneurship, but exactly how this affects the entrepreneur once they have decided on an entrepreneurial venture is still up for debate.

Creativity also plays a role in entrepreneurship. Ward (2004) indicates that the entrepreneur “must generate valuable ideas for new goods or services that will appeal to some identifiable market, and having identified those potential opportunities, [the entrepreneur] must figure out how to bring the project to fruition” (p. 174). Fillis and Rentschler (2010) indicates that “researchers of entrepreneurship should be interested in the concept of creativity since it is often associated with unusual solutions to solving problems” (p. 29) and that a competitive advantage exists for the entrepreneurs who possess creative talents. Belitski and Desai (2016) indicate that creativity plays a significant role in economic development through entrepreneurship. This connection between creativity and entrepreneurship is established, but which aspects of entrepreneurship are affected and how creativity plays the role it does in entrepreneurship is still being researched.

It is not immediately clear that links exist between metacognition and entrepreneurship; however, research conducted by Cox (2016) indicates a relationship between metacognition and opportunity recognition. Ustav and Venesaar (2018) recommend that improving metacognition is beneficial for entrepreneurs. Mukherji, Mukherji, and Hurtado (2012) claim that metacognition is

related to entrepreneurship, but only in the sense that it drives action (which would correspond to the effectuating mind). Haynie and Shepherd (2009) discuss how the entrepreneur who is metacognitively aware has an advantage over an entrepreneur who lacks this skill. Furthermore, Haynie (2005) indicates a link between metacognition, cognitive adaptability and entrepreneurship. It does seem reasonable to insinuate a link between metacognition and entrepreneurship.

Motivation is connected to entrepreneurship. Boyer (2016) found that motivation was a significant influence in predicting entrepreneurial success. Estay, Durrieu, and Akhter (2013) argue that motivation in entrepreneurs depends on linking behaviors to tangible results while being moderated by the entrepreneur's expectation of rewards for their behaviors. Cantú Cavada, Bobek, and Maček (2017) indicate that motivation is important for entrepreneurship but plays a different role depending on the gender of the entrepreneur. The more specific aspects of entrepreneurship that motivation affects in the entrepreneurship process remains unclear.

While these non-cognitive skills clearly play a role in entrepreneurship, it is often unclear exactly how the entrepreneurial process is affected by each one. Is a hierarchy among these skills present? Are different skills more applicable to the entrepreneur depending on the stage of the entrepreneurial process they are in? While it seems to be established that these non-cognitive skills do play a role in entrepreneurship, there remains a significant gap in the research regarding which aspect of entrepreneurship is affected.

2.9 Entrepreneurship and Cognitive Skills

Earlier in the literature review, entrepreneurial traits were examined but direct relationships between entrepreneurship and specific cognitive skills were not identified. Much of this research is focused on general links between specific cognitive skills and their relationship to entrepreneurship. There is some research as to how a specific cognitive skill helps the entrepreneur,

but overall a research gap remains. This study aims to narrow down how these cognitive skills serve the entrepreneur in the entrepreneurial process.

Sustained attention is related to entrepreneurship. Gifford (1992) indicates that “the optimal allocation of entrepreneurial attention determines the size of the firm, its rate of growth and the firm’s level of innovative activity” (p. 265-266). Interestingly, Gifford (1992) also notes that information overload is a problem that affects the attention of entrepreneurs. It would not seem unreasonable that this problem has gotten worse for entrepreneurs to deal with as information has become more accessible with the advent of mobile phones and the Internet. Bird (1988) argues that entrepreneurial attention is utilized at the same time as entrepreneurial intent, with the entrepreneur’s intent to focus on something driving where their attention is placed. It seems reasonable to say that sustained attention is a component of successful entrepreneurship.

Response inhibition seems important for entrepreneurs. Shepherd (2004) indicates that when entrepreneurs encounter failure they must “use negative emotions to focus their attention on the event while simultaneously not allowing that focus to become cognitively inefficient” (p. 275). Geldthof et al. (2014) identified a relationship between self-control and entrepreneurship, particularly entrepreneurial intent. Zhao and Xie (2020) applied a theory of self-regulation to argue that entrepreneurial emotions influence an entrepreneur’s intention and behavior. Is there a difference between response inhibition and self-control? This could be an interesting avenue for future research, but for now, it seems acceptable to recognize that response inhibition plays a role for entrepreneurs.

Baron (1998) identifies the sheer volume of information that entrepreneurs must deal with as they encounter new situations, noting specifically that entrepreneurs are susceptible to information overload. Speed of information processing aids the entrepreneur as they cope with

this process. Shepherd (2004) indicates that “maintaining information-processing efficiency appears to be important for... the entrepreneurial process” (p. 283) which supports the link between speed of information processing and entrepreneurship. Haynie and Shepherd (2009) imply that metacognition impacts speed of information processing, and it was established earlier in the literature review that metacognition is related to entrepreneurship. Vaghely and Julien (2010) also indicate that entrepreneurs possess an uncanny ability to process large amounts of information, but they also link this ability with the ability recognize opportunities. It remains to be seen if there is a link discovered in this study between speed of information processing and opportunity recognition; however, it seems fair to say that speed of information processing is linked with entrepreneurship.

Studies on multiple simultaneous attention and entrepreneurship seem scarce. The term “multitasking” was also investigated but the researcher did not find any studies that seemed applicable. It is unclear if there is a lack of research on the relationship between multiple simultaneous attention and entrepreneurship or if alternate terms to represent this cognitive skill in the literature were simply not discovered during the search. For now, it seems reasonable to indicate no link between entrepreneurship and multiple simultaneous attention.

Studies on the effects of working memory on entrepreneurship are also rare. Baron and Henry (2010) indicate that experts in their fields (not necessarily referring to entrepreneurs) are more capable of efficiently utilizing their memory to perform their craft at a high level. For now, it seems reasonable to indicate a minimal link between entrepreneurship and working memory.

Cognitive flexibility and control appears connected to entrepreneurship. Haynie and Shepherd (2009) indicate that “the ability to sense and adapt to uncertainty may characterize a critical entrepreneurial resource” (p. 708). Haynie (2005) indicates that both metacognition and

(what he calls) cognitive adaptability are related to entrepreneurship. Dheer and Lenartowicz (2019) argue that cognitive flexibility contributes to entrepreneurial intent. Based on these studies, a connection between entrepreneurship and cognitive flexibility and control is proposed.

It is unclear if category formation is related to entrepreneurship. Baron and Ensley (2006) discuss how new and experienced entrepreneurs categorize opportunities differently, with new entrepreneurs focusing on innovative products while more experienced entrepreneurs focused more on profit. Categorizing opportunities differently based on experience as an entrepreneur indicates a link between entrepreneurship and category formation. Locating studies in favor of a connection (or lack thereof) between category formation and entrepreneurship was difficult but serves to further emphasize the need for research between cognitive skills and entrepreneurship.

Pattern recognition seems to be associated with entrepreneurship. Baron and Ensley (2006) indicate a relationship between pattern recognition and opportunity recognition, specifically referring to how experienced entrepreneurs seem to have an advantage over new entrepreneurs when it comes to selecting and analyzing opportunities that go on to be more successful. Baron (2006) further argues that pattern recognition related to opportunity recognition can be improved as a specific skill related to entrepreneurship. Hisrich, Langan-Fox, and Grant (2007) argue that while entrepreneurship (specifically opportunity recognition) has been linked to pattern recognition, empirical studies are scarce. It seems reasonable to connect pattern recognition with entrepreneurship.

While these cognitive skills clearly play a role in entrepreneurship, it is often unclear exactly how the entrepreneurial process is affected by each one. However, opportunity recognition was identified as being connected to multiple cognitive skills. Which of these skills present has the largest impact? Are different skills more applicable to specific entrepreneurial minds? While

it seems to be established that these cognitive skills do play a role in entrepreneurship, there remains a significant gap in the research regarding which aspect of entrepreneurship is affected for many of these skills. It will be interesting to empirically investigate these connections in this study.

2.10 Video Games, Simulations and Learning

Many video games exhibit sound pedagogical principles. Gentile and Gentile (2008), for example, describe seven aspects of video game design that can make them effective for teaching and learning: having clear objectives, active learning due to the cycle of practice (to beat the game) and feedback (how one performs in the game), the phenomenon of “overlearning” which makes the skills required for the game essentially automatic, both extrinsic and intrinsic reinforcement, scaffolding and sequencing to increase difficulty/complexity/pace, adjustability and adaptability to the user’s skills level and pace, and the development of skills that must be transferred into different contexts and situations within the game. The depth and variety of these in-game situations suggests that Vygotsky’s (1978) zone of proximal development is important to game design. Gumulak and Webber (2011) also identify that well-designed video games keep players challenged and entertained. Ventura, Shute, and Kim (2012) argue that video games are great for “exposing players to challenging problem solving activities” (p. 1262), again indicating that video games may be designed to initially keep players in the zone of proximal development as they progress through the game. Nakamura and Csikszentmihalyi (2014) identify a concept known as *flow* where a person utilizes a skill to complete a challenging activity. If the game is too easy (lower challenge than skill), the player becomes bored, while if the game is too difficult (lower skill than challenge) then the player may feel anxious and quit playing. But when flow is achieved in a video game, the challenges encountered are equal or close to the skill of the player

which is similar to Vygotsky's (1978) zone of proximal development. A learner in a classroom may enter a zone of proximal development when at the edge of their abilities in a situation created by the teacher and can move past the challenge either with the help of the teacher, a classmate or on their own. In a video game, the game designer is not physically present, but the experience of the player depends on the game designer's use of scaffolding. If a game designer does not pay attention to the zone of proximal development in relation to the game (i.e., has the player had the opportunity to learn the skills required to move past the current challenge in the game?), the player's level of skill will not match up with the difficulty of the situation in the game they are playing. Keeping the player in the zone of proximal development becomes the responsibility of the game designer and while the social interaction of Vygotsky's original theory is not present, it does not seem to diminish the importance of the zone of proximal development to game design. There appears to be effective pedagogy (or intentional design) behind the development and refinement of skills that help players perform better in a video game.

Gentry (1990) also specifically identifies "pedagogies with increasing experiential learning potential [as] group case assignments, **simulation games**, descriptive/analytic field projects and consultative field projects" (p. 17-18). Garris, Ahlers, and Driskell (2002) identified that "interactive technologies provide opportunities to create learning environments that actively involve students in problem solving" (p. 441-442). They (2002) also developed a video game model (Input-Process-Game Model) based on research around experiential learning and the viewpoint that the player will be "actively constructing knowledge from experience" (p. 446) as they play the game. This model states that the user interacts with the characteristics of the game and its instructional content in a cyclical pattern of behavior, feedback, and judgment, which can then be linked to the learning outcomes (regardless of whether these learning outcomes are

predesignated) of playing the game through reflection after gameplay. Gumulak and Webber (2011) further indicate that literature on computer games places an “emphasis on problem-based and experiential learning” where “players worked hard to achieve their gaming goal” but that “the learning did not necessarily come from what the game was most obviously ‘about’ [Gumulak and Webber’s emphasis]” (p. 246). The evidence is compelling that learning through video games is a form of experiential learning.

The immersive and experiential nature of learning within video games seems to be supportive of the entrepreneurial learning process. Gentile and Gentile’s (2008) work on the pedagogy within video games and Gentry’s (1990) work on experiential learning in simulation games provides useful context for this study. While the focus of this study was not on how to use video games for developing or refining cognitive and non-cognitive skills related to entrepreneurship, there may be pedagogical implications that emerge as well as directions for future research.

2.11 Video Games and Cognitive/Non-Cognitive Skills

There seems to be evidence of opportunities for pedagogy in video games, but the influence of playing video games on cognitive and non-cognitive skills is more nuanced. Different types of video games provide a variety of environments to the player, with some environments being more relevant for learning than others. In some cases, different game types demand different cognitive and non-cognitive skills than others. Oblinger (2006) argues that “arcade-style games are good at improving speed of response, automaticity and visual processing [while] adventure games are useful for promoting hypothesis testing and problem solving” (p. 4). Green and Seitz (2015) indicate that action video games have “been linked with myriad enhancements in cognitive function, from low-level vision through high level cognitive abilities, while playing many other types of video games fails to produce equivalent impact on perception and cognition”

(p. 103). Dye, Green and Bavelier (2009) specify that action video games improve speed of information processing. Green and Bavelier (2004) also argue that people who play video games have advanced skills in divided attention (multitasking) and reaction time (speed of information processing), and that playing video games enhances these two skills. Anguera and Gazzaley (2015) caution that there is not enough evidence to definitively say that computer simulations (specifically video games) improve cognitive skills that can be transferred outside of the video game. However, Boot, Blakely, and Simons (2011) caution that while many studies claim improvement of cognitive skills for people who play video games, these studies also include some methodological problems that call such claims into question. Video games seem to make an impact on the player, but exactly how this impact happens and whether it is positive or negative remains a matter of debate.

Although it seems that video games can both influence both cognitive and non-cognitive skills, the exact effects of playing video games on these skills are still unclear. Particularly when the variety of games available is considered, the impact of each individual game on individual cognitive and non-cognitive skills varies. Despite this, video games are a viable tool to observe the use of cognitive and non-cognitive skills. Though not the focus of this study, the research on whether specific cognitive and non-cognitive skills are developed by playing video games and whether such skills are transferable to other situations outside of the video game lacks adequate evidence to make that connection yet.

2.12 Video Games and Entrepreneurship

Based on the previous information in this literature review, it is reasonable to conclude that entrepreneurship education programs may help some students acquire and/or practice entrepreneurial skills and traits. Furthermore, entrepreneurial learning is experiential in nature. Video

games also seem to be linked to the development of cognitive and non-cognitive skills. Since first-hand experience involving financial resources is something that aspiring entrepreneurs may lack, providing an experiential simulation in the form of a video game where entrepreneurship can be learned could offer an additional avenue for students to learn entrepreneurship traits and skills.

Tomczyk (2011) applied a mixed-methods approach to link entrepreneurial intent with playing video games. He found that video games helped enhance entrepreneurial traits, though he acknowledged that not all video games are created equally in this respect. As part of an older article, Feldman (1995) indicated that computer-based simulations can be used to teach and learn the process of entrepreneurship. It has been over twenty years since Feldman's (1995) article was published and since then, both computer-based simulations and video games have undergone a substantial advance in what they are capable of offering as a learning experience. More recently, Fellnhofner (2015) has concluded that serious games can be used to teach entrepreneurship by significantly influencing entrepreneurial behavior and intentions.

In a small mixed-methods study that involved quantitative questionnaires and qualitative reflection journals with thirty-seven participants, Williams' (2011) indicated that students' find business simulation games engaging when instructors used them to teach the management competencies relevant to business. Williams' (2011) study also found that using a simulation known as SimVenture to teach these skills, the students were forced "to synthesize and integrate what they read [and make] actual decisions based on facts or data presented in the case" (p. 19). In another small study that involved forty-one university students, teachers and entrepreneurs completing a survey, Bellotti et al. (2012) concluded that some simulation video games adequately teach management skills but neglect to focus on the innovation or motivation aspects of

entrepreneurship. In a trial involving over two thousand participants, Huebscher and Lendner (2010) concluded that simulation game seminars improved entrepreneurial learning. Their (2010) study supports the use of video games for learning entrepreneurship even though the specific cognitive and non-cognitive skills learned by the participants did not seem to be analyzed in detail.

Politis (2005) argues that experience in entrepreneurship is a crucial factor for becoming an entrepreneur. Video games offer the opportunity to simulate situations where students can gain experience in competencies related to entrepreneurship, potentially sharpening the underlying cognitive and non-cognitive skills that contribute to success as an entrepreneur. An advantage of using video games for gaining experience as an entrepreneur include online delivery within a low risk environment over a long period of time. Video games are also widely available and relatively accessible which means that the development of skills related to entrepreneurship can be available to anyone regardless of their formal participation in entrepreneurship education programs. However, more work needs to be done in this area.

2.13 Video Games, Entrepreneurship and Cognitive/Non-Cognitive Skills

It is worth noting that there is a wealth of research on using apps and video games for learning in other specific disciplines like mathematics and language acquisition. As one example, Devlin (2011) devoted an entire book to the subject of learning mathematical reasoning through apps and video games. He (2011) also developed an app (known as Wuzzit Trouble) where mathematical reasoning and problem-solving skills are required to advance through the levels. In the area of language acquisition, Huyen and Nga (2003) note that games are a valuable way to teach students vocabulary. Kukulska-Hulme (2009) indicates that learning languages is readily available on mobile devices and this availability has only grown more prevalent since that article

was written. More generally, Bork (2012) identifies that students exercise critical thinking and problem-solving skills as they beat levels within a video game that get more difficult, enhancing their cognitive development.

There is some evidence that video games influence cognitive and non-cognitive skills. As part of an ethnographic study, Checa-Romero (2016) utilized a combination of video games and film with primary school students to develop critical thinking skills. The evidence in Checa-Romero's (2016) study indicates that not only can psychological skills be learned by students through the medium of video games, but that they are also an engaging way for the students to learn. Using a performance task, Ventura, Shute, and Zhao (2013) argue that video games likely attract players who possess high levels of persistence which could be useful for improving motivation. Using interviews and a review of the literature, Yan (2014) identified that recent graduates can learn soft skills such as communication, problem solving, decision making, team cohesion, and creative thinking within massively multiplayer online role-playing games (MMORPGs).

Parong et al. (2017) had students play a custom designed video game focused on development of the executive function skill of shifting between competing tasks and conditions. Using this custom-built video game, they conclude that even with a relatively small amount of play time, "practice of a cognitive skill in a game context transferred to performance on the same skill in a non-game context" (p. 1). Though Parong et al. call this skill an executive function task, it appears to be assessing cognitive flexibility, one of the cognitive skills identified for this study. According to Perju-Mitran and Budacia (2014), playing video games has "the propensity to strengthen students' capacity to acquire most of the psychological and cognitive processes associated with entrepreneurship" (p. 342). This area seems to be particularly lacking in research,

indicating the importance of studies investigating entrepreneur, cognitive and non-cognitive skills, and video games to continue building the research space.

If situations can be created within video games and simulations where younger students utilize and practice using their cognitive and non-cognitive skills for entrepreneurship, these capacities may be fostered, which will benefit them regardless of whether they choose entrepreneurship as a future career option or not. It is not the intent of this study to determine whether these cognitive and non-cognitive skills are affected by play, but to determine which cognitive and non-cognitive skills are displayed and if they may be linked to specific areas of entrepreneurial skill.

2.14 Critique and Contribution

Much of the research drawn upon in this literature review has been derived from meta-analyses, literature reviews, or has been cited by other scholars more than one hundred times each. Examples include Politis (2005) (cited over nine hundred times) and Gutman & Schoon (2013) (cited around one hundred twenty-five times). Though citation count is an imperfect measure of quality, it does illustrate that other researchers also found those studies reliable enough to base their own work on them. There are a few more specific studies (small mixed methods trials, strictly qualitative studies and recent, but brief journal articles) with fewer citations that have also offered relevant information on this topic such as research by Perju-Mitran (2014) and Parong et al. (2017). The research has also been drawn together from the distinct areas on entrepreneurship, video games for learning and cognitive/motivational psychology. Based on the review of the literature, there is a dearth of research that examines relationships between entrepreneurship, video games, and cognitive/non-cognitive skills. While there are some studies that investigate two of these areas simultaneously, few investigate all three areas at once. The

implication here is that there is room for further study in the overlapping regions of entrepreneurship, video games and cognitive/non-cognitive skills (Figure 2.1).

Duening's (2010) work plays a crucial role as a framework for this study. Overall, the framework of the five minds is a useful model to apply as we look for entrepreneurial traits/behavior and the cognitive/non-cognitive skills that contribute to this behavior. It is well supported by Howard Gardner's previous research and identifies areas of importance for entrepreneurs that are corroborated by other researchers. In a thorough literature review, Politis (2005) directly supports opportunity-recognition and coping with the liability of newness which relate to the opportunity-recognition, risk-management, resilient, and effectuating minds. As a part of her Ph.D. research, Baum (2015) also found that opportunity-recognition and the ability and desire to solve problems are necessary for entrepreneurs which also supports the opportunity-recognition, designing and effectuating minds identified by Duening.

Duening's model was originally geared towards the development of curricula for training entrepreneurs and not the individual development of specific skills that are used by entrepreneurs. Perhaps for this reason, each of the five minds have a slightly vague definition that is open to interpretation. This study attempts to address this ambiguity with specific questions and observation of in-game behaviors (see Appendices B and C). These questions and in-game behaviors have been created and identified to elicit potential information and responses related to the five minds from the participants. Defining the cognitive and non-cognitive skills and examining them against entrepreneurship was also completed in the literature review to improve the clarity of Duening's framework. This structure should provide insight into the application of a combination of cognitive and non-cognitive processes behind students' behavior in the game. Furthermore, Duening avoids directly identifying the cognitive and non-cognitive skills relevant to each of the

minds as his model was originally developed for the design of curricula. By determining which skills are exhibited within each mind, this study may form a foundation for future research into whether these entrepreneurial skills can be developed or hindered by playing certain types of video games. Baum (2015) also distinctly identifies implications for educational organizations to help restructure our educational system to benefit the formation of entrepreneurial minds and this study will contribute to that growing body of research. Finally, it is also possible that the data emerging from this study may result in suggestions to modify the five minds framework as it pertains to the teaching/learning of entrepreneurial skills as well as identify potential modifications to the definitions of cognitive and/or non-cognitive skills.

As mentioned above, much of the research cited in this literature review was from meta-analyses. A potential concern is the rigor of the individual studies that were reviewed as part of the different meta-analyses. For example, Martin, McNally, and Kay (2013) acknowledge that the rigor of studies involved in past meta-analyses is a limitation of their literature review of meta-analyses. In that literature review, they conclude that much of the research that pertains to entrepreneurship education is low quality (of the forty-two studies examined in that meta-analysis, only six of them had randomized control/treatment groups) which led to a tendency to overestimate the impact of entrepreneurship education. Their (2013) meta-analysis identifies a specific concern related to research on entrepreneurship education programs, but it also directly supports the need to continuing researching them, how they affect the students who participate, the potential teaching methods used within them and how these programs are designed in the first place. Martin, McNally, and Kay's (2013) study is not directly connected to the research topic of this thesis as it is related to the overarching structure and effectiveness of entrepreneurship education programs and the pedagogy within them; in contrast, this study focuses on the

combination of cognitive and non-cognitive skills related to entrepreneurial behavior that students exhibit in a specific scenario. This study will contribute to expanding the research on video games, cognitive/non-cognitive skills, and entrepreneurship, which may lead to further research applicable to the overall design of entrepreneurship education programs and the teaching methods used within them.

2.15 Summary

Playing a video game is an experience where learning, entrepreneurial behavior and cognitive/non-cognitive skills can be observed. The fact that video games are a suitable avenue for observing this behavior and these cognitive and non-cognitive skills contributes to the design of the study (Chapter 3). Furthermore, the literature review establishes that entrepreneurship itself has aspects that can be learned, how entrepreneurship is learned and traits that are common between entrepreneurs in different industries. Finally, the definitions of cognitive and non-cognitive skills required clarification as did their applicability to entrepreneurship, which was accomplished in the literature review. As such, this study will contribute to expanding the research on video games, cognitive/non-cognitive skills, entrepreneurship, and the interrelationships among these areas.

CHAPTER 3

METHODOLOGY

3.1 Overview

The methodology of this study is best described as qualitative, pragmatic, and descriptive. The researcher collected empirical data (observations and interviews) on the students' behavior. Collecting data in this way was consistent with the idea that interpretivist research is subjective by nature. This methodology was chosen in order to best address the research question of this study, which looked to identify and describe the behaviors of students within the video game that corresponded to the application of specific areas of cognitive and non-cognitive skills. To provide one example, Hisrich, Langan-Fox, and Grant (2007) argue that while entrepreneurship (specifically opportunity recognition) has been linked to pattern recognition, empirical studies are scarce, and this study will help fill in this research gap. To improve clarity, the researcher defined in-game behaviors and cognitive/non-cognitive skills (see Appendix C).

The primary data collected within this study included screen captures (video footage of a computer screen including audio) of each participant's performance while engaged in the video game. The screen recording preserved a record of the student's performance for repeated observation and analysis. Some images of Capitalism Lab can be found in Appendix D. The students were placed in a room to play the game on their own which would likely be a similar environment to how the participants would interact with the game outside of a research study. These recordings were taken but their content was reviewed several weeks after the students had finished playing the game. According to Cohen, Mannion, and Morrison (2007), this method of data collection and analysis is a "semi-structured observation" as the researcher prepared a scenario to search for specific behaviors but then only observed the students within the game after the fact.

Since the observation occurred after the recording was taken, the researcher had minimal or no interaction with the student when the primary data was being collected to minimize the researcher's influence on each of the student's in-game performance. The researcher did start the game tutorial for the students and showed the students' how to toggle pausing the game but left the room after starting the recording software but before gameplay began.

Two secondary pieces of data that were collected included completing an entrepreneurship survey immediately before gameplay (survey found in Appendix E) and audio recordings of a short (twenty-minute long) interview with each student immediately after they finished playing the game. These additional data helped to provide context for the video recordings as well as provide another angle to answer the research question. The researcher was present when the secondary data was collected as it was necessary for conducting both the interview and survey.

3.2 Procedures

Students played a video game called Capitalism Lab, in which students manage and operate a business, competing against the computer to see who can earn the most profit. Capitalism Lab is a complex and dynamic game where both the player's choices and the choices of the in-game competition (the computer or artificial intelligence (AI)) influenced the outcome of the game. As students played the game, the screen and audio were recorded so that the researcher could examine their behavior during the game. By setting up the study this way, the researcher ensured that the data was in line with Zhou's (2016) suggestion that non-cognitive skills can be measured by a student's behavior or performance as they attempt a task and that performance on this task "usually depends not only on an individual's non-cognitive skills but also on cognitive ability as well as incentives and emotion at the time of performing tasks" (p. 10). In this way, measuring the application of cognitive skills using their performance in game was a valid

approach. There were no external incentives offered to participants for this study. The experimental procedure also accounted for Politis' (2005) argument that learning entrepreneurship must be done in an experiential manner as the students were actively playing the game.

3.3 Sample

The sample of students who participated were Grade 11 and 12 students. None of the students had experience playing Capitalism Lab before this study. The classification for their stage of cognitive development would depend on the opinion of different theorists. For example, Piaget (1971) would have classified these students at the formal operational level (i.e., from around age twelve to adulthood, where abstract thinking begins developing), but Vygotsky (1978) would have said that this development continues later in life and that specific socio-cultural factors affect their cognitive development. Whichever specific theory is selected to classify students, the researcher notes that at this age it should be expected that these students have reached a stage of cognitive development where the cognitive and non-cognitive skills identified in this study are developed sufficiently that students were able to apply them both individually and simultaneously.

3.4 Methods

In this study, six students completed a short survey from Business Development of Canada (Appendix E) to gather some initial data on the students' entrepreneurial traits and tendencies, then they played the game for about thirty minutes with a short semi structured interview (specific questions are included as Appendix B) conducted afterwards. A video analysis tool was developed (Appendix C) to look for behaviors within the game and was later used to analyze the recordings of the screen as the students' played the game.

3.5 Instrumentation and Data Collection

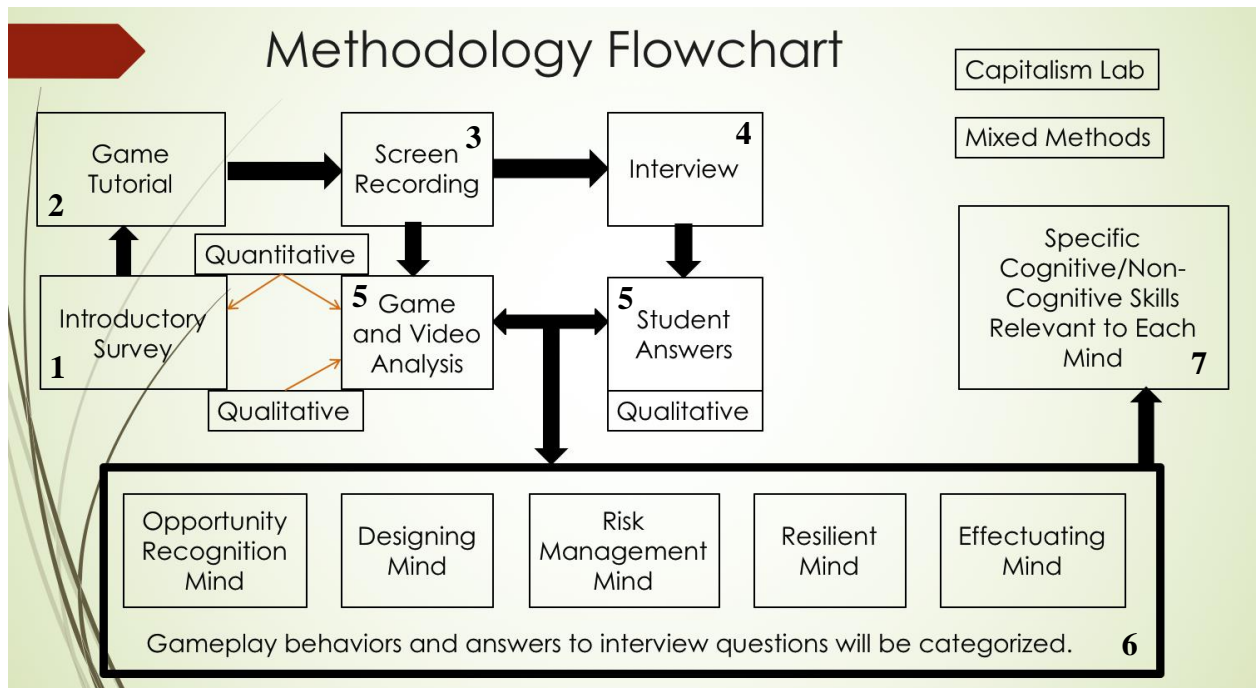
This study used a survey of entrepreneurial proclivity from Business Development of Canada to gain a sense of the entrepreneurial traits of the students initially, which allowed the researcher to examine and reflect upon the students' performance within the game in the context of these initial traits. The initial survey provided a baseline for the participants' initial entrepreneurial skills and comfort levels with entrepreneurial situations. The survey is found in Appendix E. The methodology is outlined in Figure 3.1.

A colleague (teacher) was invited to participate in a pilot test of the research instruments to ensure each part of the process worked as intended. As the pilot participant played the game, screen capture recordings along with audio recordings were collected. An audio recording of the interview was collected after the screen captures were taken. The pilot study also allowed the researcher to tweak the structure of some of the interview questions and test whether the questions were specific enough to elicit responses that could provide insight into the five minds and cognitive/non-cognitive skills. This pilot test helped to add additional in-game behaviors that the researcher originally missed when the initial generation and categorization of behaviors was completed.

The questions in the semi structured interview (see Appendix B) were designed to elicit students' reflections on their gameplay experience and decision making, which could then provide clues to the cognitive and non-cognitive processes directing the student's behavior as well as each of the five minds. A video analysis/observation tool was developed to apply to the video footage with specific in-game actions/behaviors linked to the five minds that the researcher investigated (see Appendix C).

Figure 3.1.1

Diagram of the research tools and methodology.



3.6 Treatment of the Data

These methods included using a priori and inductive coding to examine the interview and screen capture recordings for evidence that either aligned with or refuted the five minds framework. The researcher also calculated some descriptive statistics from the survey results. There may have been other statistical methods (numerical analysis of final gameplay statistics or cluster analysis) that could have been applied to the data but given the research question and small sample size, the researcher decided that the selected methods were appropriate to describe and explore the behaviors that fall into the areas of five minds. These behaviors were then linked to the cognitive and non-cognitive skills. Once this coding and analysis was complete, the researcher discussed the results of the experiment using the qualitative and quantitative data compared against the cognitive and non-cognitive skills applied within each of the entrepreneurial minds in

Chapter 5. The interview was transferred into a written transcript from the audio recordings by a colleague. The researcher coded both the interview and screen capture recordings to identify meaningful data for this study with categories according to the framework from Duening. *A priori* codes were developed (Appendix C) to identify in-game behaviors that aligned with the five minds framework from Duening. Some inductive coding was also done following both the pilot study and student recordings as not all the potential in-game behaviors that would be relevant to the framework were determined beforehand. These *a priori* and inductively coded in-game behaviors were categorized using the five minds framework after several reviews of the transcripts and video recordings.

3.7 Limiting the Effects of Bias

The underlying philosophical basis for this study is pragmatism, where validation of the results “rests on observations and interpretations” (Brinkmann & Kvale, 2015, p. 292) made by the researcher. Given this background, there is bias related to the researcher’s values and ethics that is present due to the philosophical basis of the study; however, this bias would be present regardless of the researcher’s specific values and ethic. To explain, the research question is one that is based on describing the behavior seen within a specific context under the lens of Duening’s five minds. If the theoretical framework for this study were changed, the reported results would be different. The researcher chose a descriptive research question, outlined the methodology thoroughly, and collected empirical evidence that supported their claims while simultaneously filling a research gap in the existing literature. The descriptive nature of the question, reliance on empirical evidence, and transparency from the researcher is intended to reduce and/or expose any bias in this study present. Given the study’s preliminary nature, the researcher feels that the methods were appropriate.

The researcher has striven to provide clear definitions for the theoretical framework and the cognitive and non-cognitive skills, while collecting reviewable evidence to support their analysis. For this study, the researcher investigated in-game actions and how these actions could be related to entrepreneurship and cognitive/non-cognitive skills. The researcher provided some recommendations for future research in these areas, but due to the nature of the study (i.e., small sample size, initial investigation, and highly specific research context) the results cannot be generalized for other games.

The researcher deliberately chose to code the in-game screen recordings and interviews personally. From a pragmatist point of view, what matters is that data is collected and then interpreted as it relates to the research question and is reasonable and useful for the context and research purposes. Garrison et al. (2006) indicates that “researchers must select their coding methodology and design their data analysis in accordance with the research question” (p. 3). The interviews were transcribed by a colleague while the video footage was converted to action logs of what the student was doing during intervals of one minute in the game by the researcher, which was analyzed with the interview data in the results section. These action logs included a simple description of what actions the student performed during gameplay to minimize the amount of interpretation that was done by the researcher. Since the goal of the study was to describe the cognitive and non-cognitive skills that students exhibited during gameplay, the researcher felt that pursuing negotiated coding would not significantly improve the trustworthiness of the study enough to offset the bias introduced by the researcher training someone else on the codes that were created for this study.

3.8 Limitations

This thesis focuses on identifying behaviors relevant to entrepreneurship that indicate the application of a combination of cognitive and non-cognitive skills specific to each area of the five minds (see Table 6.1 in Chapter 6). The influence of and ranking the importance of the individual cognitive and non-cognitive skills identified in this study that make up each of these five minds is outside the scope of this study. In addition, since this study aimed to identify and describe the cognitive and non-cognitive skills applied by students in a specific context while playing Capitalism Lab, generalization of the results to other types of video games is not possible. The study's methodology is primarily qualitative, which makes the outcomes of this study context dependent. Different games, participants of different ages, or different amounts of playing time may have provided a different outcome. There were a variety of personal factors that could not be controlled, including but not limited to the participants' attitude towards video games, initial level of competence with video games, interest towards the video game, in-game goals, short-term emotional state on the day of gathering data, truthfulness and/or accuracy when answering questions, and short- or long-term mental health. Cluster analysis of the data was originally planned but was ruled out as confounding variables emerged. For example, students changed and adjusted the in-game speed, so some students had different amounts of in-game play time (i.e., at the end of the half hour period some students had only progress of 1-2 years, while others had 10+ years elapsed in the game) which made it difficult to compare quantitative values between students as was originally planned.

The researcher notes as well that Capitalism Lab does not model the entire entrepreneurial process. The missing aspects of the process (for example, students did not need to secure/provide funding to undertake their entrepreneurial project) have little if any impact on the study as it is not relevant whether the game can teach the entrepreneurial process or improve the

entrepreneurial outcomes of players; rather, this study is concerned with the behavior of the players as they play the game. This behavior should provide insight into the cognitive and non-cognitive skills utilized by the player during gameplay. However, the researcher does not expect these limitations to diminish the results of the study as its intent is to describe and explore the skills applied by students in a specific scenario.

3.9 Delimitations

Despite the sample size being small, a large amount of data was generated for each student which made it necessary to limit the number of participants. For geographic practicality, one location was selected. Computers and recording equipment for the study were transported to the site where the data was collected. Since the study was done with students who were actively participating in their regular courses, restricting the participation to a single school was also done to minimize the impact of the study on the students' regular activities as well as school administration and facilities. Additionally, a computer with the required hardware for simultaneously playing the game and recording the gameplay was essential as well as the necessary software license for Capitalism Lab. Given the research question and preliminary nature of this study, the study pursued collecting qualitative data over quantitative data. The researcher does not expect these delimitations to diminish the results of the study as its intent is to describe and explore the skills applied by students in a specific scenario.

This pragmatic study involved collecting both qualitative and quantitative data. Students completed a survey, played Capitalism Lab for approximately thirty minutes, then were interviewed about their in-game experience. As the six Grade 11 and 12 students from a single location played the game, both the computer screen and audio were recorded for future examination.

This study design should allow identification of cognitive and non-cognitive skills utilized by students during gameplay and their relationship to entrepreneurial behaviors.

3.10 Summary

This chapter has outlined the (primarily) qualitative methodology that will be used in this pragmatic study. To summarize this methodology, semi-structured observation (recordings of gameplay) complemented interviews with the participants and descriptive statistics on the entrepreneurial traits of the participants. The participants were six Grade 11 and 12 students from a Saskatchewan high school. Once the empirical data is collected, it will be coded against the entrepreneurial minds. Since the data is being obtained using a specific scenario and Capitalism Lab, there are certain limitations and delimitations. The results of this study will not be able to be generalized beyond the specific scenario investigated but should still allow insight into which cognitive and non-cognitive skills are related to different entrepreneurial minds.

CHAPTER 4

RESULTS

4.1 Overview

In this primarily qualitative study, the six Grade 11 and 12 students who participated in the project completed a survey on entrepreneurship, played Capitalism Lab for thirty minutes each, then answered questions pertaining to their thinking or behavior during gameplay. The thirty-minute time allotment was selected to investigate the student's application of cognitive and non-cognitive skills in their initial experience with the game rather than complicating the study with strategies determined from playing the game prior to this recording. Although this was not a phenomenological study, the aim was to observe the learner's 'pre-reflective' behaviors 'in-game'. The follow-up interviews allowed some reflection of their recent gameplay experience. While more sessions of gameplay would have been interesting to investigate, this initial amount of time was appropriate to investigate the initial behavior as student's interacted with the game. Once some skill was developed in the game, their behavior would have changed as well and restricting the time allowed a closer look at their initial instincts.

This chapter reports results for Students A, B, C, D, E, and G. Student F was scheduled to participate, but withdrew after the letters were assigned to each student. The survey results were saved as Adobe portable document format (PDF) documents and collated for each individual student. The gameplay was recorded as a screen capture that included audio. The interviews were recorded as audio files. Following the data collection, the audio interviews were transcribed. The screen capture recordings were also transcribed and turned into a written log of in-game behavior, split into one-minute intervals. The interview transcripts and log of video footage were both coded according to the five minds framework. Finally, the coded sections within the five minds

were examined to determine which behaviors were most salient in providing evidence of cognitive and non-cognitive skills in the discussion section.

4.2 Survey Results

The results of the survey were consistent with the low rates of nascent entrepreneurship identified by Delmar & Davidsson (2000) in first world countries (which was less than 5% in countries like the USA, Norway, and Sweden). People who are naturally inclined towards entrepreneurship seem to be rare. The student participants scored lower on average than the average score of entrepreneurs (on average ~8% lower than entrepreneurs) regardless of the category examined. Although the sample size for the current study was small, it should be noted that there were some individual students who scored higher than entrepreneurs in specific categories in Figure 4.1, particularly Student B and Student C. The survey results for this study demonstrate that these students possess some entrepreneurial characteristics, but not to the level of established entrepreneurs. Based on the rates of nascent entrepreneurship previously described by Delmar & Davidsson (2000), this group could be considered a limited microcosm (i.e., most people are not entrepreneurs) of the entrepreneurial characteristics of high school students as we begin to explore the minds related to entrepreneurship. However, some bias may be present as students who were attracted to entrepreneurship may have volunteered while students who were not interested in entrepreneurship may not have.

Figure 4.1.1

Excel Chart of Students Survey Results Compared Against Entrepreneurs

Entrepreneurial Traits	Entrepreneur	Student A	Student B	Student C	Student D	Student E	Student G	Student Averages
General Profile	84%	69%	82%	88%	75%	72%	67%	75%
Motivations	82%	66%	82%	89%	79%	70%	63%	75%
Need for Achievement/Success	85%	70%	80%	80%	95%	80%	85%	82%
Power/control Appeal	85%	75%	85%	95%	100%	60%	60%	79%
Need for Challenges/ambition	80%	65%	70%	90%	60%	85%	55%	71%
Self-Sufficiency	75%	50%	94%	94%	56%	50%	50%	66%
Aptitudes	84%	74%	79%	89%	70%	71%	71%	76%
Perseverance/Determination	88%	69%	75%	94%	81%	75%	81%	79%
Self-confidence/Enthusiasm	81%	63%	88%	94%	81%	75%	69%	78%
Tolerance towards Ambiguity/Resistance to Stress	79%	79%	75%	92%	58%	71%	71%	74%
Creativity/Imagination	88%	79%	79%	79%	67%	67%	67%	73%
Attitudes	84%	61%	86%	82%	70%	77%	61%	73%
Perception to act upon one's destiny	83%	58%	96%	79%	75%	71%	63%	74%
Action oriented	85%	65%	75%	85%	65%	85%	60%	73%
Averages	83%	67%	82%	88%	74%	72%	66%	75%

Note. The green cells denote scores that are higher than those found in Belmar and Davidson's (2000) study.

4.3 Screen Capture Observations and Corresponding Results

Reporting the results of the data collection has been organized so as to provide observations related to each mind. These observations include the coded gameplay results and interviews. The main research question of this study focused on describing the links between the cognitive and non-cognitive skills behind student behavior related to the five minds. To answer this research question, the gameplay results and interviews are reported together under each of the five minds. The gameplay results are reported for each mind within a table that includes three columns: Code Tag, Number of Occurrences, and Examples of Behavior Identified. The Code Tag includes a brief description of the type of behavior observed while Number of Occurrences records the number of times that the behaviors were observed within each Code Tag. The Examples of Behavior Identified includes a sample of a few different behaviors within each code. To help read the data included in the *examples of behavior identified* section the researcher has placed student quotes in quotations marks and italicized the researcher's comments inside of brackets. Common abbreviations utilized in these tables include:

- CTI for Customer Traffic Index
- IO – Identifying Opportunity Mind
- DM – Designing Mind
- RM – Risk Management Mind
- RS – Resilient Mind
- EM – Effectuating Mind.

Within each mind, some codes were specifically and deliberately selected for deeper observation of the behaviors identified while other codes were deemed insufficiently observed. This deeper look at some codes provided additional context and connections to overarching themes in the data. The selection of codes for further examination was based primarily on four factors: 1) number of occurrences, 2) how specific or distinguishable the behavior was to the code used, 3) number of students who exhibited the behavior and 4) the ease of connecting the behavior to the entrepreneurial minds. The researcher also noted that some codes that were examined more closely in the results were less salient in the discussion. Only the behaviors relevant to the targeted entrepreneurial mind are discussed further in Chapter 5. At the end of each section the codes were narrowed down to specific codes that were more strongly representative of the entrepreneurial minds. Specific justification was included for each code that was discounted and each code that was selected for further discussion at the end of the results in Table 6 and Table 7.

4.4 Opportunity-Recognition Mind – Gameplay Results

The researcher examined the gameplay sample for evidence of behavior corresponding to the opportunity-recognition mind. More than 113 instances were identified across the six samples where the skill of opportunity-recognition was exhibited. Most of these fell into four out of

the eight specific coded categories: High Traffic (14), Computer Not Selling (22), Price Change (23), and New Business Type (34).

Table 4.1

Opportunity Recognition Mind Codes with Behaviors

Code Tag	Number of Occurrences	Examples of Behavior Identified
IO – Another City – <i>attempting to take advantage of the other cities</i>	8	<p>Student C looks for air conditioners in the top left product menu, then realizes they can look at the products from other cities and selects this option.</p> <p>Student D selects their second product slot and switches the city back to all cities which gives them more product options.</p>
IO – Buy Stock – <i>buying stock in a company</i>	0	None of the students purchased stock during gameplay.
IO – Computer Not Selling – <i>selling a product the computer is not</i>	22	<p>Student B continues examining the list of products they can sell. The student eventually selects washing powder as their first slot of three. (<i>Researcher comment– this product did not have anyone else selling it and there were a lot of other products that could have been chosen.</i>)</p> <p>Student E decides to sell beds in their final product slot. (<i>Researcher comment – no competitors.</i>)</p> <p>Student E selects bread in their second product slot. (<i>Researcher comment – no competitors.</i>)</p> <p>Student G decides to build a convenience store, placing it in a location with a Customer Traffic Index (CTI) of 9. (<i>Researcher comment - anything above 25 is considered high.</i>) The student decides to sell cigarettes in the first slot at their convenience store. (<i>Researcher comment – no competitors.</i>)</p>
IO – Game Problem – <i>student accidentally limited their own opportunities</i>	2	Student G exits the seaport and goes to their toy store. They select toy doll and replace them with another business’s toy doll. (<i>Researcher comment – the student still has not linked the sections together.</i>)
IO – High Traffic (25+) – <i>placing a business in a</i>	14	Student A is deciding where to place their building, checking the Customer Traffic Index (CTI) and land cost. Student: “This one has hella people.” After several

<i>place with high Customer Traffic Index (more people to buy from your business)</i>	seconds of moving around, they select an area to build with CTI of 33.
	Student A opens the main top left menu and decides to build an apparel store. They place it directly across from their apartment at a CTI of 42.
	The researcher begins setting up the game for the student. Student D begins playing at about 30 seconds. The student selects the top left menu and decides to build a convenience store at a location with a CTI of 35.
	Student E opens the top left menu again and decides to build a drug store. They place the drug store at a location with a CTI of 39.
	Student E decides to build an automobile outlet store, placing it at a location with a CTI of 36 after scanning the map for a while.
IO – New Business Type – <i>student places a business they did not have before</i>	34 Student E opens their drug store menu, then exits and check the occupancy rate of their apartment (<i>Researcher comment - 56%.</i>) then opens the top left menu. The student examines the menu for factories, commercial buildings, then farms before deciding to build a large farm. The student builds the large farm for a total cost of about 15 million. The student selects a layout where they are producing eggs and frozen chicken.
	Student E opens the top left menu and decides to build a headquarters, then cancels this and changes to an electronics store. The student scans the map, placing the electronics store at a location with a CTI of 30. The student selects a layout with no advertising, they attempt to replace the layout, then cancel. The student attempts to link the first product but none are available.
	Student G opens the top left menu and tries to build a media firm but does not have enough cash so they decide to build a medium sized factory. They do not have the cash to do this, so they switch to the smallest size factory. They place the factory at a location for a total cost of about 5 million.
IO – Price Change – <i>changing the price of products to gain</i>	23 The price of beds was decreased from \$400 to \$336. Student E continues examining the menu at the department store. The student increases the price of golf clubs from \$84.00 to \$90.40. The student notices the city average

market share and profit

price was still higher than the price they selected for golf clubs. They exit the department store menu and opens the supermarket menu. Then they begin adjusting the price of eggs from \$3.00 to \$2.50, under the city average of \$2.79.

Student E placed the mouse cursor over their apartment to check the occupancy rate. They open the drug store menu, then exit. They open their department store again and check their products. They increase the cost of beds again from \$500 to \$520, which is still under the city average.

Student C is searching for a location to build the apartment. The student abandons this idea, then access the apartment again and builds it in a location away from most other things. The student decreases the price of their apartment's rent to 85%.

Student E examines the graph of firm profit in the top of the menu. (*Researcher comment – they are losing money right now.*) They continue to mouse over a few options in the menu. Then they exit the menu and examines the occupancy rate of their apartment (*Researcher comment - It has increased to about 46% now.*), then opens their supermarket menu and examines their prices. They exit the supermarket and open the department store. They check their prices and increase the cost of beds from \$520 to \$548, which is still under the city average of \$580.

IO – Type of Business – *when students placed businesses to complement previously built ones*

16

Student E opens their drug store menu, then exits and check the occupancy rate of their apartment (*Researcher comment - 56%.*), then opens the top left menu. The student examines the menu for factories, commercial buildings, then farms before deciding to build a large farm. The student builds the large farm for a total cost of about 15 million. The student selects a layout where they are producing eggs and frozen chicken.

Student A selects the apartment. **Student:** “Is this making me money?” The student examines the menu of the apartment, looking at shopping convenience. **Student:** “They want a retail store. Ok. Well, we’re gonna make a clothing store here for you.”

Total

132

When the researcher reviewed the behavior codes, it was apparent that some of the behaviors (particularly the behaviors within the IO - Price Change, IO - New Business Type, IO - High Traffic, and IO - Computer Not Selling codes) seemed to provide more relevant insights into the entrepreneurial minds than the other codes.

4.4.1 Opportunity arising from focusing on in-game details.

The High Traffic code was utilized when a student placed a business according to the gameplay mechanic where a number is applied to rate specific locations on the map on their suitability for businesses. During gameplay, this is called Customer Traffic Index (CTI) and the higher the number, the better the location is suited to starting a business. Some students realized what the CTI meant and began to take slightly longer to place businesses, exploring the map to look for good locations with high CTI. This was a repeated behavior by Student A and Student E who both overtly identified the gameplay mechanic. Students B, C, D, and G did not understand the mechanic, placing their businesses in poor or average CTI locations without examining the map for very long. For this code, it demonstrates that some students identified a gameplay mechanic they could take advantage of within the context of the game to help their performance. In this way, Students A and E were able to recognize an opportunity they could exploit.

The Computer Not Selling code was utilized when a student chose a product to sell that the computer players were not selling at the time when the product was selected. The computer players may have begun selling the product selected later in the gameplay. (Admittedly, earlier in the gameplay the students could have selected the products by accident rather than deliberately.) Both the student and the computer could have started businesses selling products that were in different sectors by chance. Later in the game, product selection became more difficult as the computer began to diversify both the types of businesses and the products being sold. One

repeated behavior that was identified was that students attempted to start businesses that the computer was not engaged in, even when they did not have the cash available to do so. At some point during their gameplay, products that would directly compete with the computer were chosen by all students even when alternative products (i.e., those that did not compete with the computer) were available to sell. Selling an alternative product would have given each student an in-game advantage.

4.4.2 Exploiting one game mechanic.

The Price Change code was utilized when a student altered the price of an item being sold at one of their businesses. All the students examined a few different pieces of in-game data before this behavior developed including profit/loss bars, supply/demand bars, statistics, and menu information. (See Appendix D for more clarification of in game information and menus.) Students B, C, D, E, and G realized that they could adjust the prices that their goods were being sold for in different stores. This detail was missed altogether by Student A. Once this realization happened, the students (particularly Student E) adjusted their prices to exploit a few different opportunities in-game. One of these opportunities arose because the average price for a good in the city was known and the students could adjust the price of their goods to be just underneath the city average. When the price was adjusted in this way it often allowed them to gain market share and drive sales because their prices were cheaper than other locations in the city. This behavior demonstrated that the students identified a specific gameplay mechanic they could take advantage of within the context of the game to help their performance, which in this case is the direct and deliberate recognition of an opportunity that could be exploited in the game.

4.4.3 Difference between strategy and execution.

The New Business Type code was used to identify if students were choosing types of businesses that diversified their overall business model, selected products that expanded their product diversity or exploited an opportunity that the computer was not yet taking advantage of. When students came across information during gameplay, some interpreted this information before their next decision was made. For example, Students A, B, and C identified mineral deposits and attempted to place mines on them, but neither Student A nor C could afford to do so as building mines in-game was quite expensive. Nevertheless, the students attempted to place mines to diversify their business when a deposit was discovered. A wide variety of businesses and products were built and sold by most students as they attempted to earn a profit in-game. This diversification naturally allowed the students to select businesses that the computer did not have, but whether this was deliberate or accidental was difficult to discern. The students also examined the menus for various options when deciding which business to place next. While both Students A and G chose the type of business to place on a quick and seemingly random basis, a good portion of the businesses placed were built only after some careful examination of the menu, which usually ended when the student decided to try out a new type of business that they were previously uninvolved with at the time. If a student felt like they had made a mistake with the business that they had chosen, they would usually attempt to get out of the business by selling or demolishing it.

4.5 Opportunity-recognition Mind – Interview Results

All of the students were interviewed following gameplay and asked questions designed to elicit specific information related to the five minds. Their answers to the questions pertaining to the opportunity recognition mind resulted in the identification of several themes: business

placement decision opportunities, the role of prior knowledge and instinct, seeking in-game information, and consistency of action.

4.5.1 Business placement decision opportunities.

The interview questions (Appendix B) about the opportunity-recognition mind yielded some interesting results. Students A, C, and E were quite conscious of specific in-game information and were deliberate about where they placed their businesses according to the CTI number. In response to the question asking how they decided to place their business, Students A, C, and E responded:

Student A: “Umm, they said how much traffic was in the area and how many people were in the area. So I put them in the high traffic areas.”

Student C: “I just kind of put them in the mostly heavily populated areas so that way more people would be able to like visit my stores.”

Student E: “Umm seeing like how, is the people indexed, or there’s a number. And there’d be like; I’d look for mid twenties or at least into the thirties and I’d place it there. That’s what I’d do for all my buildings.”

Students D and G just went with their hunch that placing businesses in the center of populated areas was better than on the outskirts but could not specifically identify why they considered this to be an advantage during gameplay. When students were questioned about how they decide which type of business to start and where to place it, they responded:

Student D: “I tried to get as close to the centre as I could.”

Student D: “Because it was obviously more uh, I don’t know, be more appealing to more people. And the price of the land was a lot higher.”

Student G: “Uh, where there was like it was the most busy so like downtown kind of area.”

Student G: “I don’t know, I just picked, I just started with the department store and just went from there.”

Interestingly, Student B could not explain why they had placed their businesses in specific locations and seemed to lack awareness of some of the in-game mechanics that they could have taken advantage of to earn more profit.

Student B: “Well there was like a business located, then there were uh like populated places vs uh because like one store like where there was a lot of roads and roadways and stuff like that; I put an autobody like. And then like stuff like uh like I just kind of look at what the lands gave was and where stuff would be most effective.”

4.5.2 The role of prior knowledge and instinct.

For all study participants, this was their first experience playing the game on their own and all of the students seemed to rely heavily on their prior knowledge, instinct and interests when playing the game. When questioned about it, it became apparent that the businesses they started were not the result of realizing a specific in-game opportunity but the result of relying on previous knowledge or interest about a business or product outside the game. When asked about which type of business they would start, Students D and E responded with:

Student D: “I started with uh just a retail store. And then I was just uh picking things that just looked like the, the demand was high so I could uh...”

Student E: “Umm, ones that kind of interested me. So like there was a sports facility, there’s an automobile one, there’s a farm but I think I sold my farm. Uh, there was like an apartment building; I don’t know really what it did I just thought it would be cool to see what it would do.”

4.5.3 Seeking in-game information.

Students that did take the time to scour the game menus and look for mechanics or information that they could exploit tended to have higher performing businesses and performed well in the game. This behavior was based on recognizing some information that they believed would be helpful to them in the game and then acting upon it. Specifically, Student E realized that they could manipulate the prices of their products to get an advantage and were quite conscious that what they were doing was giving them an advantage in the game. Clearly, Student E had recognized that there was an opportunity.

Student E: “Oh, I just bought one store and then I looked, there’s like comparing the prices to like the city kind of average and I’d lower [my price] a bit. See what it does, and then if the city average goes up, I would raise mine up just underneath of it. And I just kept making money and I did that with all my stores that I’d buy. I would just stay underneath what everyone else had. And [it] just kept working.”

4.5.4 Consistency of action.

The above quote also illustrates how consistency was important. An understanding of the in-game mechanics of a video game is a prerequisite for recognizing opportunities that can be

exploited. However, students also were able to perform well in Capitalism Lab by taking consistent action instead of worrying about looking to exploit opportunities that were available due to the in-game mechanics. To the researcher, it seems clear that opportunity-recognition is an important aspect of performing well in Capitalism Lab, but it was not the only aspect of entrepreneurship that students relied upon during gameplay.

4.6 Designing Mind – Gameplay Results

The researcher examined the gameplay recording for evidence of behavior that corresponds to the designing mind. Around 140 instances of the designing mind were identified across the six samples. Most of these corresponded to three out of the seven specific coded categories: Advertising (25), Different Businesses (48), and Training (18). as shown in Table 6. When the researcher reviewed the behavior within the codes, it was apparent that some of the behaviors (particularly the behaviors within the DM - Advertising, DM – Different Businesses, and DM - Training codes) seemed to provide more interesting insights into the entrepreneurial minds than the other codes.

Table 4.2

Designing Mind Codes with Behaviors

Code Tag	Number of Occurrences	Examples of Behavior Identified
DM – Advertising – <i>when students chose to advertise their products</i>	25	<p>Student A decided to advertise on TV after clicking through a few of the inventory and sales slots. Student: “We’re gonna advertise it. Get that money...”</p> <p>Student A chose to advertise nearly all of their businesses except - They select a plan with no advertising. Student: “We don’t gotta advertise a grocery store. Everyone buys groceries.”</p> <p>Student C continues scanning the map to look for a location, eventually selecting a location with a Customer</p>

		<p>Traffic Index (CTI) of 21. The student selects a layout for the department store that includes advertising.</p> <p>Student D selects a layout for their convenience store that does not include advertising.</p> <p>Student D decides to build an automobile outlet but does not have the cash. They scan the map, looking for a place they can place the store. Eventually, the student places the automobile outlet on the land that they own. The student selects a layout without advertising.</p> <p>Student E opens the top left menu and decides to build a sports store. They place the sports store at a location with a CTI of 27. The student selects a layout without advertising. The rest of their businesses had no advertising.</p>
DM – Business Types – <i>when students created types of businesses that were complementary to their existing businesses</i>	19	<p>Student A continues attempting to build a drug store. They were looking at spots close the apartment at first, but steadily moved further away from that location when they were not able to afford the land. Student: “Oh my god you need way too much to...”</p> <p>Student D decides to build an automobile outlet but does not have the cash. They scan the map, looking for a place they can place the store. Eventually, the student places the automobile outlet on the land that they own. The student selects a layout without advertising.</p> <p>Student D examines several other options in the top left menu, but eventually decides to build a mine. The student finds the Iron Ore deposit they identified earlier again but does not have the cash needed to build the mine. The student uses the back to previous firm option a few times to toggle back and forth between their department store and golf course. They abandon trying to build a mine.</p> <p>Student A examines the main top left menu again. Student: “What else do you want... Oh you want more shopping. Oh my god.” They attempt to build a discount megastore but realize they do not have enough cash. The student attempts to build a drug store.</p>
DM – Close Business Locations - <i>when students</i>	15	<p>Student A opens the main top left menu and decides to build an apparel store. They place it directly across</p>

*created businesses
geographically
close to each other*

from their apartment at a Customer Traffic Index (CTI) of 42.

Student A decides to build a drug store and places it next to their apartment with a CTI of 33.

Student G examines the profit and loss chart in the bottom menu after attempting to reopen the apartment menu. The student opens the top left menu again and decides to build an electronic store at a location with a CTI of 18. (*Researcher comment – many of the student's businesses are close together.*) The student selects a layout with no advertising. The student selects air conditioner as their first product.

DM – Different
Businesses – *when
students created
businesses that
were different than
previously built
ones*

48

Student A selects another retail store and places a supermarket away from the cosmetic store with a Customer Traffic Index (CTI) of 27. They decide to build a large farm, placing it away from other buildings. Then they decide to try and produce a convenience store. They are examining the areas for how many people live in the area (high CTI).

Student B builds a small factory right beside their leather store. The student examines the layouts at the factory. The student continues to examine the layouts at the factory, deciding to produce leather jackets. (*Researcher comment – leather is not available for the student to use.*) The student opens the set-up factory production menu. They close this menu. The student opens their leather store menu up again. The student decides to build a discount megastore and place it at a location with a CTI of 15.

Student E examines the menu at the department store, looking at their product quality and market share of different products. The student selects their supermarket and increases the training of their staff here to full. The student opens the top left menu again and decides to build a drug store. They place the drug store at a location with a CTI of 39. The student selects a layout without advertising. The student exits the department store and begins scanning the map. They mouseover several buildings owned by the government. The student examines the menu of a government apartment. The student exits this menu and opens the top left menu again to build an apartment of their own.

		<p><i>(Researcher comment – they selected the largest apartment.)</i> They examine the map to decide on a location to place the apartment.</p> <p>Student G decides to build a convenience store, placing it in a location with a CTI of 9. The student decides to sell cigarettes in the first slot at their convenience store. The student goes to the other city and placed the mouse cursor over a seaport. The student opens the top left menu and decides to build an automobile outlet, placing it in a location with a CTI of 9. The student selects a layout without advertising. They go to link a product, and none are available. The student begins to examine the menu options for products, suppliers and cities, but nothing can be sold yet. The student places a drug store at a location with a CTI of 9 and places a layout without advertising.</p>
DM – Same Product – <i>when students selected the same product to sell more than once at a business</i>	5	<p>Student A decides to sell shampoo for all three slots. Student: “Oh, you can get it from another city. Then we can get it. I guess it’s just lots of shampoo.”</p> <p>Student B selects a sales option. They attempt to select another sales option but close the menu and open the products they can sell. They decide to sell a mobile phone in two of the slots.</p>
DM – Same Type of Business – <i>when students would pursue the same type of business repeatedly</i>	10	<p>Student B attempts to build a mine on the iron ore but does not have enough cash. The student examines the map again and eventually finds a silica deposit. The student attempts to build a mine on the silica but does not have enough cash. The student continues examining the map.</p> <p>Student C is searching for a location to build the apartment. The student abandons this idea, then access the apartment again and builds it in a location away from most other things. The student decreases the price of their apartment’s rent to 85%. The student builds their apartment in a more expensive location than their previous apartment. The student reduces the cost of their rent to 81%. The game is now unpaused. The student then pauses the game again after letting time go ahead 1 month. The student accesses the top left menu again and decides to try to build a supermarket (<i>Researcher comment – they do not have enough cash.</i>)</p>
DM – Training – <i>when a student</i>	18	<p>Student A selects their cosmetic store. They decide to train their employees there a small amount. Student:</p>

<i>adjusted the training employees at a business would receive</i>	<p>“(inaudible mumble)” The student selects their automobile outlet and decides to train their employees there about twice as much as at the cosmetic store.</p> <p>Student E opens the top left menu and decides to build a drug store. The student cancels this building (<i>Researcher comment – they do not have the cash available.</i>) and opens their department store. The student examines the menu at the department store, looking at their product quality and market share of different products. The student selects their supermarket and increases the training of their staff here to full.</p> <p>Student G opens their electronics store and increases the training up to maximum. The student opens then exits the financial reports for the electronics store, then exits the electronics store menu after clicking on auto link suppliers. The student opens their farm and increases the training to about half of the bar, then exits the farm menu.</p>
Total	140

4.6.1 Prior knowledge dictating strategy.

The Advertising code was used to identify whether students chose to advertise the products at the businesses they started. Once students had made a choice with their first business, they tended to continue their initial strategy for their next business. If the student initially chose to advertise, they continued to do this with later businesses. This was also true if they chose not to advertise. This suggests that the students may have had an advertising plan and implemented that plan for their businesses, though whether they were consciously making this decision is unclear. There was no clear pattern across students to advertise or not advertise. It is possible, for example, that the students were not familiar with the in-game mechanic and due to this lack of familiarity simply made a choice and stuck with it based on their prior knowledge of advertising.

4.6.2 Attempts to differentiate.

The Different Businesses code was used to identify whether students created or attempted to create a business that was different than their previously created businesses. All of the students created a wide variety of businesses during gameplay. Surprisingly, students would sometimes build one type of business and then immediately attempt to build a different type of business. This focus on starting a different type of business happened repeatedly across the student sample and within each individual student's gameplay. It was rare to see a student attempt to create a business that they had already built and even rarer to see a student attempt to create the same type of business twice consecutively. While the students attempted to diversify their businesses as they played the game, unfortunately they often did not have the cash available in the game to actually build the business they were trying to create. They would select a business to create and try to place it, but it would fail due to insufficient funds. While this behavior may be indicative of a long-term plan that included diversification of businesses, it is possible that the students simply wanted to try different businesses as they were not sure which types of business would be effective in the game.

The Training code was used to identify whether or not students chose to train their employees at their different businesses. The Training code was quite similar to the Advertising code as students tended to remain committed to their choice once they decided whether to train their employees or not. Whether they were aware that this was a strategy that would help them is not clear. There was no clear pattern across students to train or not train their employees. It is possible that the students were not familiar with the in-game mechanic and due to this lack of familiarity simply made a choice and stuck with it based on their prior knowledge of training.

4.7 Designing Mind – Interview Results

Students recognized the need for planning and strategy. However, many exhibited behavior that evidenced their inexperience in game. This led to difficulties generating and executing plans that may have helped them perform better in game even though diversification seemed to be a gut reaction strategy employed by students. Students also tended to evaluate their own behaviors in game as being worth repeating as they continued to do what they thought was working even if these behaviors had minimal effect on gameplay performance. When asked if they had a strategy, Students A, D, and E responded:

Student A: “No.”

Student D: “No, I didn’t actually. I was just trying to see what would happen. Uh mostly just used trial and error to see what would work.”

Student E: “Uh, trying not to lose money.”

When asked if they developed their strategy as they played the game, students replied:

Student A: “Umm, even when the game was going, I don’t really know if I had a strategy.”

Student D: “Yeah. I uh.. I don’t know. Uh, I was going to, I tried to, I guess build things that would uh be more, most appealing to what was like other businesses did not have. I tried to balance it out and tried to get uh what someone else didn’t have. Just try to get some profits from it.”

Student E: “Umm, I don’t think it ever did change, actually.”

4.7.1 The impact of the game's user interface.

The introductory questions that students were asked contributed some interesting results related to this mind. Responses above suggested that students seemed to begin playing the game by building a business without much thought towards a long-term plan. They either selected their first business by mimicking what they saw in the tutorial or just starting a business they thought would succeed based on their prior knowledge. When asked how their strategy changed, Student C answered:

Student C: “Well I kind of went from more or like a less like retail aspect which is what I saw on the tutorial into a more like, almost uuh real estate I guess.”

A few of the students mentioned that starting a variety of businesses would be a good strategy after playing but then did not exhibit this during their own gameplay session. While students attempted to start different businesses, they seldom had enough cash available to do so and would then attempt to start something else until they were successful. A follow up question asked if Student D had tried different businesses, they responded:

Student D: “No, I tried a bunch of different ones. I didn't really decide. I was building to see what was...”

Though Students C and D might have had a plan or a hunch on what to do to be successful, they were unable to consistently and successfully implement this strategy in the game due to their inexperience with the user interface and mechanics in the game. These types of answers were repeated by the students throughout most of the designing mind questions in the interview as students had difficulty generating a strategy since they were not exactly sure what they were able to do in the game.

4.7.2 Instinctual diversification.

It remains unclear if any students had and executed a well-defined strategy based on comments made during the interview. The strategies used seemed to be generalized ideas of what should be done rather than specific actions. When asked about their strategies, Students E and G responded:

Student E: “Uuh, trying not to lose money.”

Student G: “Uuh, I don’t know. Probably just keep expanding.”

When the students were questioned Students B, D, E, and G indicated that diversification was at least a partially deliberate strategy, while Students A and C indicated that it was not their strategy. When students were asked why, they responded:

Student A: “I just did it random.”

Student G: “Pretty much just built different variety of stores; put different products out.”

Students A and G identified that they were just starting businesses that were different than their previous endeavors because they thought it would work better than what they had tried earlier, especially when they were not being successful in the game. When Student C was probed about their in-game strategy, they responded:

Researcher: “Okay. You talked a little bit about your strategy being to start with warehouses and do that.”

Student C: “Yeah.”

Researcher: “But then you said that that did not work.”

Student C: “No.”

Researcher: “So can you kind of explain how that strategy changed as you played the game?”

Student C: “Well I kind of went from more or less like retail aspect which is what I saw on the tutorial into a more like, almost uh real estate I guess. So yeah, that’s the turn that I took is I just got rid of all of my warehouses and all my factories and supermarkets and stuff, and just went right into building apartments and I was going to look into building a mansion but that’s really...”

When pressed for more information on diversifying during the interview, none of the students clearly explained why they had made the choice to try different businesses even though all of the students had attempted to diversify their businesses. As one example, Student E responded:

Student E: “Umm, I picked just different kinds of businesses, and then see how they make and then umm see how they can compare to the city average and see if they would help make or lose the money. And then I think all my stores were helping make, seemed like; other than my farm; I didn’t know what to do with it so I just put it up for sale. Yeah.”

4.7.3 Strategy and repeated execution.

The interview questions related to the designing mind also revealed some interesting information about the students’ thinking as they played the game. The lack of initial strategy was identified by Student A, D and E. Student A indicated that they never really developed a strategy throughout the gameplay, while Student E was simply repeating actions they felt were in line with their goal. Student D recognized the need for a strategy, but repeatedly executed the same

behaviors during gameplay. When asked if they had an initial strategy, Students A, D, and E responded:

Student A: “No.”

Student D: “No, I didn’t actually. I was just trying to see what would happen. Uh mostly just used trial and error to see what would work.”

Student E: “Uuh, trying not to lose money.”

When asked how they adjusted their strategy during gameplay, Students A, D, and E responded:

Student A: “Umm, even when the game was going, I don’t really know if I had a strategy.”

Student D: “Yeah. I uh.. I don’t know. Uh, I was going to, I tried to, I guess build things that would uh be more, most appealing to what was like other businesses did not have. I tried to balance it out and tried to get uh what someone else didn’t have. Just try to get some profits from it.”

Student E: “Umm, I don’t think it ever did change, actually.”

These responses corroborate the answers provided in the initial interview questions. The researcher also found that all students had difficulties explaining why they had done specific things during gameplay. Student E identified repeating some of the behavior they had used in the first attempt if they were given another chance to play the game. When asked about their longer-term plan, Student E responded:

Student E: “Make a lot, buy maybe more, more of the same stores. Get the exact same prices as or maybe even lower and then see maybe like kind of go more in depth. Even try the stock market if I found out about it.”

This was true even with behavior that did not really have any effect on gameplay, though to the students it must have felt like that behavior was working. The evidence for this feeling of discomfort with the game (given that it was their first time playing it) was reinforced when students identified that they were just trying to figure out what to do to be successful in the game. When Student G was questioned about their long-term plan, they responded:

Student G: “Uh, I don’t know. Probably just keep expanding.”

When questioned about how they planned to achieve their goals in game, Student A responded:

Student A: “At first I was in debt the whole time and all the profits were going down. So I wanted to get, kind of evened out to make money.”

Researcher: “Mmh hmm. So did you have a strategy of how to do that?”

Student A: “No.”

Researcher: “Or were you just trying to survive?”

Student A: “Yes, I just kept changing things off until something worked.”

As it was their first time playing the game, the students seemed to be trying to figure out how to be successful in the game. The students who found something that worked in game wanted to

repeat it, while those that had more trouble with the game indicated that their strategy was to experiment with different game mechanics.

4.8 Risk Management Mind – Gameplay Results

The researcher examined the gameplay sample for student behavior for evidence of behavior that corresponds to the risk-management mind. The researcher identified around one hundred and seven instances across the six samples where the risk-management mind was exhibited, though most of these corresponded to two of the nine specific coded categories: Avoid Loans (30) and Complementary Products (21). When the researcher reviewed the behavior within the codes, it was apparent that some of the behaviors (particularly the behaviors within the RM – Avoid Loans and RM – Complementary Products codes) provided more insight into the entrepreneurial minds than the others.

Table 4.3

Risk Management Mind Codes with Behaviors

Code Tag	Number of Occurrences	Examples of Behavior Identified
RM – Avoid Loans – <i>when a student attempted to avoid or reduce the amount of money they took as a loan</i>	30	<p>Student A opts to borrow money from the bank. Student: “We’ll take a loan.” The student borrows about 2 million from the bank at 9% interest. (<i>Researcher comment – the minimum amount they could have borrowed.</i>)</p> <p>Student A repays another \$600,000 of their loan. (<i>Researcher comment – they had 1.3 million in cash before this.</i>) Student: “How much money do I owe? Oh my god... Ok now we’re making...” The student repays another \$700,000 of their loan.</p> <p>Student D has run out of cash at this point in the game. The game is paused. The menu takes them to their convenience store and the student puts it up for sale. (<i>Researcher comment – this will not work; the student needs to demolish the firm and sell the land.</i>) The student demolishes the convenience store and sells the land. (<i>Researcher comment – this</i></p>

		<p>gives them 5.9 million in cash, but their profit is now -8.4 million.)</p> <p>Student D begins trying to exit the menu. (<i>Researcher comment – they cannot, as they have no cash.</i>) The student then decides to borrow 9.9 million dollars (<i>Researcher comment – of a possible 19.8 million, at 6% interest.</i>) The student then resumes the game and pays back 1.5 million dollars immediately to the loan.</p>
RM – Complementary Products – when a student selected products that were similar as their own single business	21	<p>Student A selects a layout plan that includes advertising and decides to sell blazers, jeans and leather jackets.</p> <p>Student D selects a layout for the warehouse that includes input, storage and output. The student decides to put sports shoes and golf clubs in their warehouse. The student opens the menu for inputs of sports shoes and changes it to outputs. The student pauses the game.</p> <p>Student E decides to sell eggs in their first product slot. (<i>Researcher comment – another company is selling eggs and has 75% of the market share.</i>) The student selects bread in their second product slot. (<i>Researcher comment – no competitors.</i>) The student selects frozen chicken in their final product slot. (<i>Researcher comment – 75% market share is held by a competitor.</i>)</p> <p>Student G places a drug store at a location with a Customer Traffic Index (CTI) of 9 and places a layout without advertising. The student selects cough syrup as their first product, cold pills as their second product, and shampoo as their final product. The student exits the menu and begins to scan the map.</p> <p>Student G reopens the top left menu and places the automobile outlet at a different location with a CTI of 12. (<i>Researcher comment – next to their other businesses.</i>) The student selects a layout that has no advertising, then selects car as their first product, motorcycle as their second product and car as their final product. The student increases the training at their automobile outlet to maximum. The student examines the menu for a moment, then exits it.</p>
RM – Diverse Products – when a student would sell products that would not	22	<p>Student C selects shoes as their first product. Then goes to select their second product (<i>Researcher comment – their current other options are leather wallets or bath lotion.</i>) but begins to examine the menu. The student looks for air conditioners in the top left product menu, then realizes they</p>

<i>be normally sold together at a location</i>		<p>can look at the products from other cities and selects this option. (<i>Researcher comment – this adds quite a few more products for them to sell.</i>) In the end, they go back to the products sold in their current city and choose leather wallets as the second product.</p> <p>Student D clicks the toggle supplier link, but this does not do anything for them. The student chooses to place beds at their warehouse as well, then examines the supplier of their sport shoes. Once at the seaport selling their sport shoes, the student begins to examine the other products that are being supplied. The student begins scanning the menu and map.</p>
<i>RM – Land Cost – when a student would base where they placed a business based on the land cost</i>	10	<p>Student A continues attempting to build a drug store. They were looking at spots close to the apartment at first, but steadily moved further away from that location when they were not able to afford the land. Student: “Oh my god you need way too much to...”</p>
<i>RM – Max Loans – when a student would max out their loans</i>	1	<p>Student D opens the top left menu again and attempts to build a mine again, but this time on the gold deposit. (<i>Researcher comment – the gold deposit is worth twice as much as the iron deposit was.</i>) The student opens the bank loan menu again. The student maxes out the amount they can borrow (<i>Researcher comment - about 33 million.</i>), but then decreases it and ultimately cancels this loan. The student goes to the top left menu again and examines the retail store options.</p>
<i>RM – Multiple Cities – when a student would consider placing a business in another city</i>	2	<p>Student C began selecting different sections of the warehouse. The student exited the warehouse and clicked the world map in the bottom left. The student examined the world map (<i>Researcher comment – which had two cities on it.</i>) and looked at the population of each before exiting the menu.</p>
<i>RM – Repeated Product – when a student would select the same product more than once at a business</i>	9	<p>Student B decides to sell sport shoes in one of the three slots and sandals in the remaining two slots.</p> <p>Student A decides to sell shampoo for all three slots. Student: “Oh, you can get it from another city. Then we can get it. I guess it’s just lots of shampoo.” The student placed the mouse cursor over the drug store to bring up the menu in the top left. Student: “Oh, we’re gonna...”</p> <p>Student B closes and reopens the menu of the apparel store. Student: “Okay....” The student selects sweater as a</p>

		product for all three slots available. The student does not set up the advertising. The student exits the menu and placed the mouse cursor over the electronics store.
RM – Same Product as Computer – when a student would begin selling a product being sold by a computer player	6	Student E decides to sell eggs in their first product slot. (<i>Researcher comment – another company is selling eggs and has 75% of the market share.</i>) The student selects bread in their second product slot. (<i>Researcher comment – no competitors.</i>) The student selects frozen chicken in their final product slot. (<i>Researcher comment – 75% of market share is held by a competitor.</i>) The student exits the super-market menu. Student B continues examining the list of products they can sell. The student eventually selects washing powder as their first slot of three. (<i>Researcher comment – this product did not have anyone else selling it and there were a lot of other products that could have been chosen.</i>) The student selects in-line skates as their next two product slots. (<i>Researcher comment - This had another company selling it with a dominant market share (over 80%).</i>)
RM – Some Loans – when a student would take out a loan, but not max it out	6	Student A exits the menu and realizes their cash is negative. Student: “Oh, we can fill... Oh no we can’t. Oh no. Let’s beg more money from the bank.” The student takes out another 2-million-dollar loan. Student D begins trying to exit the menu. (<i>Researcher comment – they cannot, as they have no cash.</i>) The student then decides to borrow 9.9 million dollars (<i>Researcher comment - of a possible 19.8 million, at 6% interest.</i>) The student then unpauses the game and pays back 1.5 million dollars immediately to the loan.
Total	107	

4.8.1 Debt aversion.

The Avoid Loans code was used to identify when students repaid loans they took out or made choices during gameplay to avoid loans, for example selling a business or land to generate cash instead of taking out a loan. All of the students but one took out loans at some point in their gameplay. The students were generally forced into taking out loans due to running out of cash as they were building and operating their businesses. Once the loans were taken out though, the students actively tried to pay them back as quickly as they could. Interestingly, this behavior could

put the student's businesses at further risk of failure since they were not keeping enough cash on hand to stay afloat in the event of difficulty. Students A and D ran out of cash more than once and were forced to take out further loans because they had put too much cash towards paying off their loans instead of keeping it on hand for their operating costs.

Alternatively, under the Avoid Loans code, Students C and D would sell seemingly struggling businesses or the land they owned to generate cash instead of taking out a loan. In some cases, avoidance of taking out a loan disadvantaged the student and their businesses heavily. In one example, Student C built an apartment but was low on cash and decided to demolish it shortly after building it. This resulted in Student C losing a substantial amount of capital (over half of the initial amount used to build the apartment) just to avoid taking on a loan. After these students had exhausted their ability to sell businesses or land to raise cash, they were forced to take out loans if they ran out of cash. When students did take out loans, some relevant behavior was also identified under the Some Loans code that is similar to what was seen under the Avoid Loans code.

4.8.2 Previous experience.

The Complementary Products code was used to identify when students decided to sell products that were similar in form or function, for example different types of clothing (Jeans, Blazers and Leather Jackets) or different types of food (Frozen Chicken or Frozen Lamb). By selecting products that complemented each other the students reduced the risk they took on by selling similar products. For example, Student A started a grocery store which sold a variety of foods that could improve profitability as the customers coming in would have had more options to purchase goods. Students A and D adjusted their products, but they seemed to pick another complementary product even when switching to something else (Cereal Bars replaced by Bread

or raising chickens instead of livestock). Students either employed the strategy of selling complementary products to reduce the risk they were taking on or they did not. This behavior was not a universal strategy employed by all students as Student C did not seem to worry about which products were being sold together.

4.9 Risk Management Mind - Interview Results

Students encountered a wide variety of situations where they needed to make decisions based on limited information about the consequences of taking certain actions in game. During gameplay students displayed behaviors suggesting risk aversion, but they were also aware that what they were doing constituted taking a risk in game.

4.9.1 Risk aversion.

Students A, C, and E identified that their goal was not to go bankrupt which demonstrates that these students were more worried about performing poorly at the game instead of focusing on performing well in the game. Their responses to being asked what their goal in game was are included below:

Student A: “Not to go bankrupt.”

Student C: “And obviously not to, you know, go bankrupt. So...”

Student E: “Trying to make and see what can help make the most; trying not to go bankrupt or anything.”

Students B and E also were uncertain about their businesses. When these students were asked if they felt like any of the businesses they started were more likely to fail than others, they responded:

Student B: “Yes.”

Student E: “I was thinking when I bought the automotive store I thought that it would fail off the start. But I didn’t know if it did or didn’t because you couldn’t switch the prices of your vehicles, they would just automatically give you a price. And it would just automatically sell it or something. It wouldn’t change it or anything. It was always higher too than the city average so I didn’t know if it would help or not.”

This risk averse behavior and feeling of anxiety seems logical to the researcher given that it was the student’s first time playing the game and the gameplay was being recorded.

4.9.2 Awareness of risk-taking.

While going through the risk-management questions, Students A, D, and G identified that they felt like they were taking a risk when trying out different businesses as they did not know what would work and what would not. When Students A, D, and G were asked if they felt like they were taking a risk when they started a business, they responded:

Student A: “Yes, every time it would lose money right off the bat.”

Student D: “Yes, I did.”

Student G: “Yeah, because I could have been losing money off the start.”

Student E also identified that they were trying several different businesses so that if one of them did not work, they would still be able to sell the ones that were failing while keeping the ones that were making a profit.

Student E: “Yeah if nothing worked out, then I just sell everything and restart.”

This diversification was also true with the types of products that were available as all students varied the types of products they were selling. This behavior would have maximized their chance to turn an in-game profit while simultaneously reducing their risk to lose money. Interestingly, Students C, E, and G did not seem to notice which products were being sold by the computer or base their actions on this. Replying to being asked if they were acting based on what the computer was selling, they responded:

Student C: “I don’t think so... No. No, I did not pick any products that the computer seemed to be selling.”

Student E: “I didn’t really notice that.”

Student G: “I didn’t notice what they were selling.”

The students were aware that they could potentially lose money when operating a business and their behavior shows that they were aware of the need to manage their risk in the game, even though they did not seem particularly comfortable with taking risks.

4.10 Resilient Mind – Gameplay Results

There were around one hundred and sixteen instances of behavior across the six samples where the resilient mind was exhibited, though most of these corresponded to three of the six specific coded categories: Frustration (20), Not Profitable (24), and Repeated Attempts (37).

When the researcher reviewed the behavior within the codes, it was apparent that some of the behaviors (particularly the behaviors within the RS - Frustration, RS – Not Profitable, and RS – Repeated Attempts codes) seemed to provide more insight into the entrepreneurial minds than the other resilient mind codes.

4.10.1 Committed to the experience.

Although it was not coded for, none of the students quit playing the game before their time was complete even when they experienced problems. All of the students were told that they could quit playing at any time if they chose to do so. The exact reason for why no student quit playing was not investigated by the researcher in the interview questions for this section but may have been related to the desire to get a break from their classes, feeling as though there was a power differential between the researcher and student, or they just enjoyed playing the game.

Table 4.4

Resilient Mind Codes with Behaviors

Code Tag	Number of Occurrences	Examples of Behavior Identified
RS – Attempt to Save – <i>when a student took action to save a failing business</i>	19	<p>Student A tries to place the clothing store but does not have enough cash. Student: “Oh, I don’t have any money. One million dollars.” The student selects the farm they created earlier but that does not have a layout. Student: “Oh, it’s this farm. Oh, we’re gonna sell it.” The student puts the farm up for sale, then unlists it.</p> <p>Student D attempts to place a link to sell something from the store, but nothing is available. The student examines the top part of this menu, clicking through different suppliers, but none are available. (<i>Researcher comments – in their current city.</i>) The student eventually decides to put the automobile outlet up for sale. The student goes back into the menu to sell something from their automobile outlet. They change the suppliers back to all suppliers and examine the products available. (<i>Researcher comments – they do not change the cities menu which is beside the other two menus.</i>) The student unpauses the game to run at a medium speed.</p> <p>Student D goes back into the automobile outlet to try and get a product up for sale again, but they exit this menu again. (<i>Researcher comment – without looking at the all cities.</i>) The student examines other options in the automobile outlet, then exits the menu. The student selects a commercial building owned by the government. The student exits this building and goes to their warehouse. The</p>

		<p>student examines the menu and selects their sport shoes outputs, then toggles internal sale option on and off again. (<i>Researcher comment – this means they would only sell within their businesses.</i>) The student continues to examine their firm revenue and firm profit at the warehouse.</p>
RS – Business Profitable – <i>when a student took action after a business became profitable</i>	6	<p>Student A moves from a negative profit to a positive profit. Student: “Are we making money now? Oh, heck yeah we are, they like that. Okay now we are making the money.”</p> <p>Student A unpauses the game. Student: “Oh, I’m making money now.” (<i>Researcher comment – they are not, but their loss is decreasing.</i>) Student: “Yes. Okay, let’s pay some of it off.” The game is paused again. The student repays a slightly larger amount of their loan off (~\$200,000).</p>
RS – Change Product – <i>when a student changed products</i>	10	<p>Student A selects their farm and decides to change the layout to produce something else. The student selects cotton as their new product from the farm.</p> <p>Student A moves on and opens the menu for their cosmetic store. The student realizes that they can sell other products at their cosmetic store. They change one of their perfume slots to sell soap and the other to sell shampoo.</p> <p>Student C examines the log in the bottom right of the screen. The student opens their factory that was previously producing leather wallets and changes the layout to produce elegant watches instead. (<i>Researcher comment – this will work.</i>) The student then exits and reopens the factory menu – examining additional alternate layouts at the factory.</p>
RS – Frustration – <i>when a student expresses frustration verbally</i>	20	<p>Student A exits the menu and realizes their cash is negative. Student: “Oh we can fill... Oh no we can’t. Oh no. Let’s beg more money from the bank.” The student takes out another 2 million dollar loan.</p> <p>Student A scans the map for 20-30 seconds. Student: “What is losing all my money?” They find a government apartment that is for sale. They open the menu for this apartment. Student: “Hey, let’s buy this.” They exit the apartment menu and find a government radio station that is for sale. Student: “How much is this? 4 million?” (<i>Researcher comment – this is their current cash.</i>) “360 million?” (<i>Researcher comment - the sale price of the radio</i></p>

station.) They attempt to purchase this firm but ultimately decide against it.

Student B has selected their electronics store again and opened the menu. The student selects one of their mobile phone purchasing sections and clicks on supplier. The student continues to examine the menu. **Student:** “Okay... (audible sigh) what am I supposed to frickin do.” The student continues to examine the menu. The game is still currently paused at this point.

Student C is scanning the map looking for a place with cheap enough land that they can build. The student abandons this idea since they do not have enough cash. **Student:** “(audible sigh) Okay.” The student unpauses the game to go quite fast.

RS – Not Profit-
able – *when the
student changed
options when a
business was not
profitable*

24

Student A pauses the game. **Student:** “That was killing our profit... Oh my god.” Their profit has dipped to about -4 million. **Student:** “Oh, now we’re 3 million, I guess apparently that wasn’t it...” The student selects the supermarket menu. **Student:** “That store is keeping us afloat...”

Student D attempts to place a link to sell something from the store, but nothing is available. The student examines the top part of this menu, clicking through different suppliers, but none are available. (*Researcher comment – in their current city.*) The student eventually decides to put the automobile outlet up for sale. The student goes back into the menu to sell something from their automobile outlet. They change the suppliers back to all suppliers and examine the products available. (*Researcher comment – they do not change the cities menu which is beside the other two menus.*) The student unpauses the game to run at a medium speed.

Student A tries to place the clothing store but does not have enough cash. **Student:** “Oh, I don’t have any money. One million dollars.” The student selects the farm they created earlier but that does not have a layout. **Student:** “Oh, it’s this farm. Oh, we’re gonna sell it.” The student puts the farm up for sale, then unlists it.

Student D goes back into the automobile outlet to try and get a product up for sale again, but they exit this menu again. (*Researcher comment – without looking at the all*

RS – Repeated Attempts – <i>when a student repeated in-game actions in a short period of time</i>	37	<p><i>cities.</i>) The student examines other options in the automobile outlet, then exits the menu. The student selects a commercial building owned by the government. The student exits this building and goes to their warehouse. The student examines the menu and selects their sport shoes outputs, then toggles the internal sale option on and off again. (<i>Researcher comment – this means they would only sell within their businesses.</i>) The student continues to examine their firm revenue and firm profit at the warehouse.</p>
		<p>Student B mouses over the retail stores and selects a footwear store, which they place in a location with a Customer Traffic Index (CTI) of 18. They select a layout for the footwear store without advertising. They replace it with the same layout again. The student tries to link a product to the footwear store, but none are available in their city. They scan the menu a bit more and switch it to display footwear from all cities.</p>
		<p>Student B switches to the products menu and begins examining the menu. The student switches from this menu to the product details menu and begins examining that as well. The student exits the menu and selects their factory. They put the factory up for sale and then remove it from the market. They then repeat this process.</p>
		<p>Student E adjusts the price of their frozen chicken from \$3.00 to \$4.02. The student exits the menu at the supermarket. The student opens their department store menu and begins decreasing the price of beds. The price of beds was decreased from \$400 to \$336. The student continues examining the menu at the department store. The student increases the price of golf clubs from \$84.00 to \$90.40. The student notices the city average price was still higher than the price they selected for golf clubs. The student exits the department store menu and opens the supermarket menu. The student begins adjusting the price of eggs from \$3.00 to \$2.50, under the city average of \$2.79. The student increased the cost of bread from \$2.30 to \$2.71, under the city average of \$3.02. The student decreases the cost of their frozen chicken from \$4.02 to \$3.60, again under the city average. The student examines the menu of the stadium a couple of times. The student placed the mouse cursor over the options in the top left menu, then scans the log at the bottom of the screen for a moment.</p>

	Student E decreases the game speed down to fairly slow. The student opens the drug store, then exits the menu. They open the department store and decrease the price of a bed from \$548 to \$528. The student exits the department store menu and opens the supermarket menu. They decrease the price of frozen chicken from \$3.60 to \$3.48. The student opens the sports store menu and examines the menu, then exits the menu. The student placed the mouse cursor over their farm, then opens the farm menu.
Total	116

4.10.2 Emotional management.

The Frustration code was used to identify when students were frustrated by something during gameplay. While none of the students were frustrated enough to quit playing the game before their time was up, there were specific moments of frustration that the researcher identified. Students A, B, and C were annoyed that things were not working the way they thought they would and would sound slightly exasperated over the microphone by sighing or swearing. However, all the students continued to play and tried to succeed in the game by continuing to act despite their frustration. Most of the action that was taken after a moment of frustration lacked a discernable pattern which may suggest the students were just trying something else even though they did not know if it would work. Even though challenges were encountered by all the students at some point during their gameplay, the students appeared to have kept their emotions under control as they were playing.

4.10.3 Bias towards action.

The Not Profitable code was used to identify situations where the student attempted to take action when they realized a business was not profitable. The researcher noted that not all these actions actually helped the student succeed during gameplay. For example, Student C took

action and changed a product that a firm was producing. Unfortunately, by doing this they prevented the business from selling items because the product the student selected to be produced could not be produced due to a lack of resources. Even though this student believed the business was still functioning correctly, it was not working. For this case, Student C felt like they needed to do something to help but made things worse for themselves. Students D and G also had similar incidents where they attempted to do something they thought would help, but instead made things more difficult for themselves. Most of the behavior identified under this case featured the students realizing they were in a situation where things were not going their way and then they tried to take some type of in-game action. Students C, D, and G attempted a few different things before settling on what they believed was working, displaying their resiliency to attempt to get things working. Students C and D were also not shy about abandoning businesses by demolishing them. This behavior suggests that Students C and D felt demolishing and starting over would have helped them advance in the game. The researcher notes that in some cases demolishing and starting over was the correct decision while in other instances it was a massive detriment to their success during gameplay. For example, demolishing a business that was failing would allow a student to recoup some of the money they had spent while demolishing a business that was successful would reduce their ability to make money. The lack of resiliency (i.e., abandoning a business) displayed in this behavior indicates an awareness that they were doing something during gameplay that was not working. Interestingly, it also demonstrates that the students felt it was more beneficial to salvage some of the cash and try again rather than waiting for the mistake to slowly drain their cash even though they might have been able to earn a profit with a bit of patience. This tendency to salvage situations that were perceived as disadvantageous in order to

attempt another action indicates their resiliency as they continued to make attempts to succeed in the game.

4.10.4 Stubbornness.

The Repeated Attempts code was used to identify situations where students repeated in-game behaviors to accomplish/attempt a task. All the students generally attempted to work through problems more than once, even when they may have left the initial task unfinished to attempt something else in game. The instinct of the students was to experiment and try again even when they failed. This behavior continued to occur regardless of the type of task the student was attempting to complete in game, though in some cases it was evident that the student was experiencing some frustration before switching tasks. Interestingly, in other instances where the student repeated a behavior that they felt was successful, the behavior was attempted immediately afterwards even if it did not contribute to the student's performance in game. Tasks that were easily reversible or adjustable were also frequently attempted by all students along with options that could be toggled on or off. The researcher noted that this code identified behavior that indicated resilience but there was also behavior identified that was not related to resilience but was still relevant to the effectuating mind.

4.11 Resilient Mind – Interview Results

As part of the resilient mind interview questions, students identified frustrations with the game interface, concerns about not being able to make money and the actions they took to try to perform well in the game. Despite a wide range of reasons for how they ended up in specific situations, most students exhibited similar behavior when under pressure in the game. The individual students appeared to regroup after difficulties, consistently evaluated their own performance,

continued to take action during gameplay and identified that it was better to take action without knowing exactly how it would affect gameplay than it was to be patient.

4.11.1 Regrouping.

Students would encounter difficulties in their businesses or with the game interface and then try to reset their progress (as much as they could) so that they could try again. When students were asked how they adjusted when something in game did not work the way they believed it would, students responded:

Student A: “Umm, I got rid of the buildings that didn’t work. I sold them.”

Student D: “I think I would uh probably just; if the business wasn’t making as much as it could, I would probably just sell the business and keep the land if the land was like good.”

Student E: “Yeah I didn’t know how to kind of like operate it or what it was supposed to do. So I just put it up for sale. I don’t know if it ever actually sold either.”

Student G: “I umm, my car; my like car shop wasn’t working so I just put it up for sale.”

Students A, D, E, and G indicated that they would attempt to sell or restart a failing business to recoup some of their money back, then move on to trying another action in the game. Rather than waiting to see if these businesses would end up profitable, these students felt that it was more valuable to them to recoup some of their initial capital and start again.

4.11.2 Instinct-based evaluation of personal in-game performance.

Despite student's lack of experience in the game, it was evident that the students came up with their own individual ways to evaluate their performance in game. Students D and G would compare their progress against the progress of the computer to attempt to evaluate whether they were performing well in game. When asked about what the computer was doing in game, students responded:

Student D: "Uh, [it was frustrating] not making money and seeing that all other businesses had a lot more uh like stores and stuff than me. It was, yeah."

Student G: "But then it just; they [the computer] were outcompeting us because there were more car shops than I had. So I probably could have just expanded and made a couple more of them..."

There was a lot of information available within the interface that students could have used to evaluate their performance, but Student A was confused by the amount of data but just kept going anyways.

Student A: "I think mostly I just didn't understand the data that they gave us in the game. And how to make money with the stores. Yeah...I just kept going. Got some loans from the bank and built more stuff."

When asked about being frustrated in game, students responded:

Student C: "Umm, no I don't think I really got frustrated. It was mostly just trial and error and seeing what works and what doesn't. Going back and forth, just trying to get the best results possible. So like..."

Student D: “Yes. I was frustrated [because the computer was outperforming them].”

Student E: “Umm, I think [I kept going] because I was always making money, never losing anything. And the bars were always green.”

Student G: “No, just that I was losing money but it’s just a game so.”

Students C, E and G evaluated their own performance and decided they were doing well in the game, they identified that they did not feel frustrated or upset when things went wrong. However, when Students A, B and D evaluated their own performance and decided they were not doing well or things were not working, feelings of frustration were identified.

4.11.3 Persistence and continued activity.

All of the students played for the full period of time. They all appeared to continue trying to take different actions in game to help their own performance, even though they were not sure about what would work. No student gave up during gameplay despite wildly different experiences and actions taken in game. There were also no noticeable periods of inaction where any student simply stopped playing the game because they were upset, before continuing to play. When asked about being frustrated in game, students responded:

Student A: “Umm, yes because I would be doing really good and then all of a sudden they would just drop off and then I’d be bankrupt again.”

Student B: “Uh, number one, the factories of course. The factories were definitely the most frustrating thing. And then...”

Student D: “Yes. I was frustrated [because the computer was outperforming them].”

Frustration was directly identified by Students A, B and D, but in spite of this, these students continued trying to play the game and doing the best they could.

4.11.4 Actions reduce uncertainty.

Students would perform an action in-game, then evaluate its effectiveness rather than consider the potential effectiveness before taking action. Student C felt like they needed to continue to click on different options in game with seemingly little thought directed towards considering the consequences of performing a specific in game action.

Student C: “Uh, how do I do this? I don’t know I was just clicking a bunch of things.”

Students B and G indicated that their intuition was to just click on different in game options until they felt things were going well.”

Student B: “Just clicking around, working with it like it’s not like it gave me a manual or anything. So like I kind of just played around with it myself, and things worked out.”

Student G: “I paused and started to click buttons to see...”

Students were persistent in continuing to play the game, regrouping when they felt the game was not going very well for them and felt that their performance was good after they took action in the game.

4.12 Effectuating Mind – Gameplay Results

There were around 180 instances of behavior across the six samples where the effectuating mind was exhibited, though most of these corresponded to four of the six specific coded categories: Consistent Action - Clicking (75), Fast Forward for Cash (36), Pausing (26), and Placing

Businesses (32). When the researcher reviewed the behavior within the codes, it was apparent that some of the behaviors (particularly the behaviors within the EM – Consistent Action-Clicking, EM – Fast Forward for Cash, EM – Pausing, and EM – Placing Businesses) seemed to provide more insight into the entrepreneurial minds than the others.

Table 4.5

Effectuating Mind Codes with Behaviors

Code Tag	Number of Occurrences	Examples of Behavior Identified
EM – Consistent Action-Clicking – <i>when a student consistently clicked the mouse during gameplay</i>	75	<p>Student B replaces one of their purchasing slots with an advertising slot and then change it to a sales slot. Student: “Okay...” The student selects the button that allows them to play a layout for the store. Student: “(audible sigh)” The student replaces the layout with one that does not include advertising. The student exits the menu and reopens it. They select the button that allows them to place a store layout again. The student clicks through the inventory, sales and purchasing options a few times.</p> <p>Student B continues examining the map for a moment, then opens the menu for their apparel store. The student double clicks on one of their purchasing pieces and then cancels the menu. They exit the apparel store. The student selects their coal mine.</p> <p>Student E selects a motorcycle as their second product and see the game mechanic again about changing price. The student exits the automobile outlet (<i>Researcher comment – only selling two of three products.</i>) and opens their drug store. They exit the drug store and open the department store menu, where they examine their products. The student exits the department store and opens the sports store menu.</p>
EM – Fast Forward for Cash – <i>when a student adjusted game speed to earn money</i>	36	<p>Student A accelerates the game speed – speeding through about 1.5 years of in-game time. (<i>Researcher comment – their available cash has increased to 15.7 million from 2.6 million.</i>) The speed of the game is decreased, but not paused. Student: “There we go, now we got lots of money. Hmm... (inaudible)” The student continues to look for a location to place their automobile outlet.</p>

Student A increases the game speed to very fast for 3 months of time. Their amount of cash basically stays the same and so they decrease the game speed again. (*Researcher comment - their profit was about -4.2 million.*) **Student:** “Okay our profit is... nope.” (*Researcher comment – their profit decreases to under -5 million.*) The student accelerates the game speed again for another 3 months. (*Researcher comment – their profit has decreased to under -6 million.*) **Student:** “Now what is it...”

Student C placed the mouse cursor over a few of the buildings and examines their own apartment. **Student:** “Ninety...” (*Researcher comment – their apartment was 90% occupied.*) The student increased their rent to 90% from 81%. The student accelerated the game to max speed again. The student lets the game run from February 1994 to September 1995. They are now making ~\$287,000 annual profit and have 5.1 million in cash. The student pauses the game. The student placed the mouse cursor over a government radio station that is for sale. The student selects their apartment again and increases the rent to 93%.

Student G selects toy doll as their first product, then begins to examine the menu clicking on a few different things, including an inventory slot. The game is still paused at this point. The student selects lipstick as their second product, then selects the supplier option on the lipstick. They exit this menu. The student selects toy racing car as their third product at the department store. They exit the menu. The student unpauses the game to run at a medium speed.

Student A maxes out the game speed, then slows it down again. (*Researcher comment – the students’ cash increases from 2 million to 8 million during this time – over one year of in-game time has passed.*) **Student:** “Okay, now we got money.”

EM – Loans – when a student borrowed money to continue ex- panding	3	Student D decides to borrow money from the bank. The student increases the amount of money they will borrow to the maximum, then down to 11 million. (<i>Researcher comment - from 19.8 million.</i>) The student accessed the menu to examine business types.
EM – Pausing – when a student	26	Student A repays another \$700,000 of their loan. (<i>Researcher comment – they had 1.3 million in cash before</i>

<i>paused or un-paused the game to take or plan action</i>	<i>this.</i>) The student pauses the game. Student: “Slow down.”
	Student C exits the apartment menu and placed the mouse cursor over their factory. They then move to their other factory producing car bodies and put it up for sale. (<i>Researcher comment - it is not actually producing anything since steel is unavailable.</i>) The student unpauses the game at this point.
	Student D selects a layout for the warehouse that includes input, storage and output. The student decides to put sports shoes and golf clubs in their warehouse. The student opens the menu for inputs of sports shoes and changes it to outputs. The student pauses the game.
	Student D exits the menu and opens the corporate details tab. The student then uses a back to previous firm button to get back to their warehouse. The student unpauses the game to a slow speed. The student puts the warehouse up for sale. The student uses the back to previous firm button to toggle between the seaport and their warehouse a few times. The student opens the warehouse menu again.
EM – Placing Businesses – <i>when a student continuously took action to try building businesses</i>	32 Student A opens the top left menu and decides they will build their own automobile outlet directly next to their competitor. Student: “Automobiles...” Short pause. Student: “Okay, let’s build it right beside... No.” They attempt to place this business for a few seconds. (<i>Researcher comment – they do not have the cash available to do so.</i>)
	Student D selects the top left menu and decides to immediately build a convenience store at a location with a Customer Traffic Index (CTI) of 35. (<i>Researcher comment – this was at the very start of the game.</i>)
	Student G placed the mouse cursor over their department store to examine the revenue and profit graphs. They open their department store, then exit the menu. The student opens the top left menu again and decides to set up a sports store at a location with a CTI of 12. They select a layout without advertising.
EM – Profitable Activity – <i>when a student takes action to try to</i>	8 Student A tries to place the clothing store but does not have enough cash. Student: “Oh, I don’t have any money. One million dollars.” The student selects the farm they created earlier but that does not have a layout.

*save a failing
business*

Student: “Oh, it’s this farm. Oh, we’re gonna sell it.”
The student puts the farm up for sale, then unlists it.

Student D opens the corporate details of one of their competitors, then exits the menu. The student opens the top left menu again and begins examining the options for retail stores. (*Researcher comment – the student has very little cash, <\$200,000 at this point.*) The student exits this menu and selects their apartment by using the last building menu option. The student selects their automobile outlet (*Researcher comment - which is for sale.*) and attempts to link a product to it. (*Researcher comment – they did not open the option for other cities.*) This fails, so the student decided to demolish the firm and sell the land. (*Researcher comment – this gives the student 7.6 million in cash, but a profit of -3.9 million.*) The game is still currently paused. The student selects the top left menu and decides to build a department store. The student begins scanning the map, looking for a location to place the department store.

Total 180

4.12.1 Feeling of urgency.

The Consistent Action - Clicking code was used to identify situations where the student was clicking the mouse repeatedly within the user interface of the game. Students consistently continued to click on different options as they played the game. It was rare to see a student stop at any moment during gameplay and consider their options, instead they opted to experiment by constantly selecting different toggles and menus in the game. This behavior did not seem to provide any of the individual students any substantial advantages in the game, as they would occasionally make choices based on their limited experience that were detrimental to their success in game. Conversely, they would occasionally make choices that they could not have known were going to be beneficial to their success, so this fast pace was not always disadvantageous either. During gameplay, Students B and E appeared confused by the consequences of their actions which indicates that the students did not consider the consequences of taking specific actions but

felt like they needed to be focused on ensuring they were always active in the game. Interestingly, this behavior did lead to Student E identifying opportunities that they could exploit and increased their in-game knowledge as they were rapidly experimenting with different options. Furthermore, all students who participated in this study exhibited this behavior in the game.

4.12.2 Bias towards action.

The Fast Forward for Cash code was used to identify moments when the students would accelerate the game speed to earn more cash. This behavior was most often seen when the student was running low on cash as they could not take action in the game without having cash. Unfortunately, some of the students who let their cash reserves run low with the game paused or running on a slow speed would actually run out of cash when they increased the game speed. The students did not want to wait for their cash to build up before trying something else in game. These lulls in the action would have been a good opportunity to collect their thoughts and plan their next move, but students seemed to prefer experimenting with different actions in the game instead of developing a longer-term strategy. It was evident that students felt it was better to continue trying to do something in game than to plan what to do next. Students also performed this behavior unsuccessfully by trying to fast forward time in game to earn more cash except their businesses were not actually earning a profit. In these cases, this strategy actually worked against them as it just accelerated their bankruptcy in game, which in turn forced more actions from the student in order to counteract the consequences of this behavior.

4.12.3 Action motivated by the in-game situation.

The Pausing code was used to identify situations where the student slowed down or paused the game. Slowing down or pausing the game would allow the students to review their current in game position and make decisions about what to do next. The students struggled with

the ability to control the game speed. There were multiple instances when students unpaused the game which caused them to immediately go bankrupt as they had not kept enough cash on hand. When students realized they were in jeopardy, they would pause or slow down the game and try to figure out why things had gone wrong. The students would mouse over menus, select buildings and traverse the map to see if they could glean any useful information. Following this period of information gathering the students would quickly act even if they were not sure the actions would increase their success. More often than not, the actions taken were only necessary because the student had changed the game speed after they recognized that they had made errors and they were attempting to salvage or remedy the situation. Sometimes the students would quickly adjust the game speed between different levels. This behavior was similar to what was described under the Consistent Action – Clicking code suggesting that students were searching for something that would improve their performance in game.

4.12.4 Lack of attention to detail.

The Placing Business code was used to identify situations where students attempted to place businesses, even when they did not have the resources to do this successfully. The students did not pay close attention to the amount of cash they had on hand, which led to an increased number of behaviors identified within this code. The behaviors identified in this code were limited in number, with the same behavior being repeated due to the students not paying attention to how much cash they had on hand.

4.13 Effectuating Mind – Interview Results

As part of the effectuating mind interview questions, all the students indicated that they felt like they needed to take consistent action rather than examining the game and planning for an optimal strategy. Students seemed to have an uncomfortable confidence as they played the game

and recognized the importance of planning and patience in hindsight even though they did not seem to realize this while they were playing. The researcher also noted the impact of the user interface on how students interacted with the game.

4.13.1 Uncomfortable confidence.

Student B identified a feeling of inadequate progress in the game along with the need to continue to expand the number and type of businesses they had:

Student B: “I felt like I had to keep making more.”

Student D also indicated that they were confident in the decisions they were making, even if they were not sure that they would work:

Student D: “Yeah. Uh, maybe not off the start, I was a little unsure of what was going to happen. But towards the end I started seeing things that maybe that were going to work, so I was confident in what I was building.”

When students made a decision to create a business that they thought would be successful but hindered their progress in game by losing money, a common exit strategy of selling the business and trying again was acknowledged earlier in the results. When students were asked how many businesses they built, they responded:

Student A: “Mmh, less than 10 I think.”

Student B: “Ooh I don’t even know. Uuh, I felt like I still could have built a bit more. Like I was feeling like...”

Student E: “Uh probably around five.”

While students expressed that they felt like they had not built enough businesses, Students A, B, and E were unaware of exactly how many businesses they had built or the types of businesses they had created. These students simultaneously identified a feeling of uncertainty they could not explain but also expressed confidence in their decisions.

4.13.2 Impact of the user interface.

Students were generally unaware of certain aspects of the game including taking out loans or selling businesses until they were put into a position where the user interface of the game forced them into taking action to remediate a situation. When students were asked about loans in game, the responses were varied:

Student A: “Umm, well I knew it was gonna come back, bite me, it wouldn’t be a good idea cause they charge lots interest but...”

Student B: “I didn’t even know I could do that so that’s...”

Student C: “Uuh, no I didn’t take any loans but I did know about it.”

Student D: “I was thinking I didn’t want to take out too much but at the same time I needed enough to...”

Student E: “Nope. I didn’t know about them.”

Student G: “No. I didn’t know I could take out loans. Yeah, if I knew how to mine and do other aspects, like take out loans and stuff, I might have done a little bit better.”

Students B, E, and G were not aware that these loans were elements of the game. Based purely on their level of success in game, each student experienced different aspects of the game due to the user interface and the rules of the game. If a student ran out of cash, they were put into a situation where they were forced to take out loans by the user interface which made sure they knew that was a gameplay option.

As indicated in the previous section, students were generally unaware of how many businesses or the type of businesses they had built, but this information was in a menu that was not immediately obvious. The number of small details present in the user interface (for example, the screen that contained financial reports for their company was not access by any student) were also largely ignored by the students. As another example, the students did not pay attention to them until the game forced them to consider the cost of a building compared to the available amount of cash they had on hand. They had completely ignored the small number representing an important quantity. How the user interface presents information to the player has a substantial effect on the gameplay experience.

4.13.3 The importance of planning and patience.

Students A and D both indicated that they felt like they built too many businesses at the beginning when they were unsure of how they would work in game.

Student A: “I think I built too many.”

Student D: “I think I built too many off the start. But towards the end, maybe not enough. I probably, I would have kept building there or whatever.”

However, upon reflection, Student D decided that they had not built enough. For Student C, they indicated:

Student C: “Uh no I didn’t ever feel unsure; I felt like [there] was always something that I could have tried. Or gone towards in order to at least try to make money. And like I was never really confused as to what I was doing. I was always planning things out, like as I went; and knowing what work and wouldn’t work and tried to figure that out by myself. So yeah.”

The poise and reflection from Students C and D respectively show off the importance of planning and patience. Additionally, Student B identified a level of comfort due to focusing on making slow but steady progress in game.

Student B: “Me? No, I was pretty confident about what I was doing.”

Students identified that their feeling of uncertainty in game was tied to the feedback they were receiving from the game about their performance. If they perceived that their performance was good, they experienced minimal uncertainty, but their discomfort increased if they perceived that they were not performing well in the game. Taking quick action in the face of uncertainty was a main strategy, but the students who took an extra bit of care in their behaviors in game benefited from this additional consideration time.

Summary

Since behavior that students display under the entrepreneurial minds is a consequence of applying their cognitive and non-cognitive skills, this study requires multiple levels of abstraction. Most of the cognitive and non-cognitive skills do not have consistent, agreed-upon

definitions in the literature, so the researcher generated operational definitions by examining the work of earlier researchers for most of the cognitive and non-cognitive skills. These decisions have influenced the researcher's interpretation of the results to the definitions of the cognitive and non-cognitive skills used in this study in the discussion. Furthermore, in the discussion the specific behavior codes that seemed to provide more insight will be critically examined to determine if the behavior found within them should be analyzed in more detail. This examination is completed in Tables 5.1 and 5.2 with justification for whether a code would be examined in more detail or not.

The researcher identified a wide variety of themes throughout examining the gameplay footage and interviews transcripts. These themes are summarized in Table 4.6 and will be examined further in Chapter 5 for evidence of cognitive/non-cognitive skills in the discussion. The number of themes in each mind is summarized in parentheses, with each theme in italics. A few themes appeared in multiple minds but were shown in Table 4.6 separately in each mind.

Table 4.6

Themes Identified Under Each Entrepreneurial Mind

Entrepreneurial Mind	Identified Themes
Opportunity Recognition Mind (7)	<i>Opportunity from focusing on in-game details, exploiting one game mechanic, difference between strategy and execution, business placement decision opportunities, the role of prior knowledge and instinct, seeking in-game knowledge, and consistency of action</i>
Designing Mind (5)	<i>Prior knowledge dictates strategy, attempts to differentiate, the impact of the game's user interface, instinctual diversification, and strategy and repeated execution</i>
Risk Management Mind (4)	<i>Debt aversion, the role of previous experience, risk aversion, and awareness of risk-taking</i>
Resilient Mind (8)	<i>Feeling committed to the experience, emotional management, bias towards action, stubbornness, regrouping, instinct-based evaluation of in-game performance,</i>

	<i>persistence and continued activity, and actions reduce uncertainty</i>
Effectuating Mind (7)	<i>Feeling of urgency, bias towards action, action motivated by the in-game situation, lack of attention to detail, uncomfortable confidence, the impact of the game's user interface, and the importance of planning and patience</i>

Each of the themes identified in Table 4.6 will be examined against the operationalized definition of each cognitive and non-cognitive skill in the discussion in Chapter 5.

CHAPTER 5

DISCUSSION

The research question investigated was “What cognitive and non-cognitive skills and behaviors relevant to entrepreneurship do students exhibit while playing Capitalism Lab?” The data collected in this study was collected via the survey results, video footage of gameplay, and interview transcripts. The survey results demonstrated that the students who participated in this study were not as proficient as established entrepreneurs (see Figure 4.1). The researcher reviewed the video footage and explored the behaviors connected to the entrepreneurial minds of Duening but narrowed down the codes that should be examined further in the discussion for specific evidence of cognitive and non-cognitive skills (Table 4.6 in Chapter 4). The researcher also identified noteworthy themes by examining both the interview results and video footage. The discussion in this chapter will center around examining these themes and the salient codes (Table 4.6) from the entrepreneurial minds as they pertain to the definitions of the cognitive/non-cognitive skills. Each cognitive and non-cognitive skill will be treated separately, using the operationalized definition from the literature review and the behavior observed under themes identified in the results. This approach allows the researcher to link empirical evidence related to the entrepreneurial minds to the student’s application of specific cognitive/non-cognitive skills to answer the research question in the discussion. The links are summarized after each cognitive/non-cognitive skill in tables with a capitalized X denoting that there was evidence of a link and dashes indicating that evidence of a link was not found. In the conclusion, further implications, and connections to other areas of research will be discussed.

The discussion includes an analytical look at connections between the definitions of each of the cognitive and non-cognitive skills and the behavior identified under different themes that

emerged in the results. The non-cognitive skills investigated included: perseverance/grit, self-control, social skills, resilience and coping, self-perception, creativity, metacognition and motivation. The cognitive skills investigated included: sustained attention, response inhibition, speed of information processing, cognitive flexibility and control, multiple simultaneous attention, working memory, category formation and pattern recognition. The themes are summarized in Table 4.6. Tables 5.1 and 5.2 provide a justification for why particular codes were or were not selected for additional consideration.

5.1 Code Relevance and Justification

For this discussion, some codes were more salient and offered observable evidence to support conjecture. Other codes were less prevalent or lacked any clear pattern of behaviour that could lead to reasonably supported insights. The justification for why some codes were not examined further is provided in Table 5.1.

Table 5.1

Codes That Will Not be Examined Further with Justification

Code Tag	Why this code was not chosen
IO – Computer Not Selling	At the beginning of gameplay, students had limited competition with the computer. Later on, they were more likely to compete with the computer because there were enough computer players that it was inevitable that competing businesses were started. Therefore, this code was omitted from the discussion due to lack of evidence of participant decision making.
IO – New Business Type	At the beginning of gameplay, students were highly likely to place different businesses. Later on, they were more likely to compete with themselves and placing-business behavior was no longer observed. Therefore, this code was omitted from the discussion for lack of observations of participant decision making.
DM – Advertising	There was no clear pattern of behavior on whether advertising was a good or bad strategy for the student. Since the students were unfamiliar with the game, they just made a

	choice and stuck with it based on their prior knowledge. Therefore, this code was omitted from the discussion.
DM – Training	There was no clear pattern of behavior on whether training was a good or bad strategy for the student. Since the students were unfamiliar with the game, they just made a choice and stuck with it based on their prior knowledge. Therefore, this code was omitted from the discussion.
RM – Complementary Products	There was no clear pattern of behavior on whether advertising was a good or bad strategy for the student. Since the students were unfamiliar with the game, they just made a choice and persisted based on their prior knowledge. Therefore, this code was omitted from the discussion.
RS – Not Profitable	There was no clear pattern of behavior identified under this code. There was some behavior identified within this code that indicated resiliency, but there was also behavior identified that indicated a lack of resiliency. Therefore, this code was omitted from the discussion.
EM – Placing Businesses	The behavior identified here (repeatedly) was the result of the same deficiency – students not paying attention to detail. Consequences of not paying attention to detail were also identified in the impact of the user interface (i.e., lack of familiarity with the interface or inability to manipulate the game because of interface opacity). Since lack of attention to detail and the impact of the user interface was supported by direct quotes from students, this code was omitted from the discussion.

Following consideration of specific codes within the five minds the researcher narrowed the focus of the study even further so that specific behaviors associated with certain codes could be closely examined for evidence of cognitive and non-cognitive skills in the discussion. These behaviors appeared purposeful, rather than coincidental. The justification for why these codes should be examined further is provided in Table 5.2.

Table 5.2

Codes That Will Be Examined Further with Justification

Code Tag	Why this code was chosen
IO – Price Change	The behavior identified within this code gave the student an advantage in game because of the opportunity to raise or

	lower prices that was exploited. It can be linked to the identifying opportunity mind.
IO – High Traffic	The behavior identified within this code gave the student an advantage in game because of the opportunity to place businesses in high traffic locations that was exploited. It can be linked to the identifying opportunity mind.
DM – Different Businesses	The behavior of students to diversify businesses and products was a solid strategy that can be linked to the designing mind.
RM – Avoid/Some Loans	Even when students were forced to take out loans, they attempted to minimize the amount they took while also paying them back as quickly as they could. The behavior identified within this code can be linked to the risk management mind.
RS – Frustration	Persevering through frustration is an indicator of resiliency. The behavior identified within this code can be linked to the resilient mind.
RS – Repeated Attempts	Attempting different behaviors multiple times is an indicator of resiliency. The behavior identified within this code can be linked to the resilient mind.
EM – Consistent Action - Clicking	The behavior identified within this code includes constant actions and can be linked to the effectuating mind.
EM – Fast Forward for Cash	Students would speed up the game in order to take more actions to accrue wealth through increasing the number and speed of business transactions. The behavior identified within this code can be linked to the effectuating mind.
EM - Pausing	Students would pause the game in order to take more actions or to contemplate their strategy and/or opportunities. The behavior identified within this code can be linked to the effectuating mind.

Based on a synthesis of research on the process of entrepreneurial learning, Politis (2005) identifies that opportunity-recognition and the ability to cope with the liability of newness (i.e., the idea that being unfamiliar with an area can negatively impact performance in the particular skill area) are among the foremost skills that entrepreneurs must possess. Politis (2005) further identifies that coping with this liability of newness includes the entrepreneur's ability to act and be flexible in the face of ambiguity, to manage risks to the business, and persist through failure.

The discussion treats the non-cognitive skills followed by the cognitive skills. This is not intended to imply a specific hierarchy amongst the skills but simply to match the order in which they were defined within the literature review.

5.2 Non-Cognitive Skills

For this study, non-cognitive skills are defined as the collection of socio-emotional and behavioral skills relevant to performance on tasks and interpersonal interactions. The non-cognitive skills investigated in the discussion are perseverance/grit, self-control, social skills, resilience and coping, self-perception, creativity, metacognition, and motivation.

5.2.1 Perseverance/grit.

As previously discussed in the literature review, Shechtman et al. (2013) define **perseverance/grit** as pursuing “long term or higher order goals in the face of challenges and setbacks, engaging the student’s psychological resources, such as their academic mind sets, effortful control, and strategies and tactics” (p. 3). There are also previously identified links between entrepreneurship and grit as found by Arco-Tirado, Bojica, Fernandez-Martin, & Hoyle (2019). Furthermore, Mooradian, Matzler, Uzelac, & Bauer (2016) have also identified links between grit and entrepreneurial success. The researcher notes relationships between the definition and behaviors observed with the gameplay under the RS – Frustration code as well as the RS – Repeated Attempts code. Themes that also seemed to be linked to perseverance/grit were identified amongst both the resilient and effectuating mind interview responses. These themes are: *Feeling committed to the experience, bias towards action (identified in both sets of interview questions), stubbornness, persistence and continued activity, actions reduce uncertainty, feeling of urgency,*

and *action motivated by the in-game situation*. It appears as though the non-cognitive skill of perseverance/grit is linked to both the resilient and effectuating minds.

The theme of *feeling committed to the experience* emerged from the observation that students played the game for the full amount of time, continuing to try to be successful in the game. Each of the students continued playing despite the individual difficulties each of them encountered during gameplay. This behavior was identified within the resilient mind, but not the effectuating mind as these difficulties were not driving them to act in the game, but students commented that they felt like they needed to continue trying for the full length of time allotted for gameplay. This theme suggests perseverance/grit; however, it is possible that some students merely wanted to be out of class longer.

The theme of *bias towards action* was identified because students pursued action over planning, even in the face of challenges. The responses from students that lead to this theme being identified indicated resiliency, but more strongly indicated a drive to pursue action within the game. The students looked for actions in game that could be taken, rather than spending time calculating their next move carefully. This theme seems strongly tied to both the resilient and effectuating mind while also indicating perseverance/grit.

The themes of *stubbornness* and *persistence and continued activity* were identified with students continuing to attempt a variety of in-game actions and then repeating each action several times, particularly when the action did not have the predicted effect. When a student ran out of cash in game, the game's user interface forced them into selecting an option that would buy them additional time to rectify the circumstances that had led them to that point. All of the students continued to play the game for the full amount of time and were consistently active. They did not spend much time idle in the game planning their next move but felt that continuing to try

different actions in the game was a more worthwhile strategy. Additionally, repeating an in-game action when they felt that it should have had a different effect was a common behavior. Both these themes seem strongly tied to the effectuating mind and imply perseverance/grit.

The themes of *actions reduce uncertainty* and *action motivated by the in-game situation* were identified due to students indicating that when they were uncertain, they felt better after taking an action in the game (whether the game's interface forced this action or not). Students would be creating businesses with the game paused, then start the game only to immediately run out of cash. The game's interface would force the student to select an action (if they ran out of cash) from a few different options so persistence/grit was not required in these instances. By focusing on taking action, Students B, C, and G were able to feel like they were making consequential progress in game, even when they were unsure of whether their actions would contribute in a meaningful way. This behavior falls firmly into the effectuating mind. Unfortunately, given the definition of persistence used in this study the students were not exhibiting the use of perseverance/grit within these themes.

The theme of *feeling of urgency* was identified due to students continuing to attempt to take action for the full amount of time that they played the game. The constant clicking of the mouse suggested experimentation within the game. Rather than take their time to read over the tooltips and strategize, clicking on different options and testing what the results of that action would be was the dominant strategy. While these students were learning how the game worked in a low-risk environment, constantly clicking on options (whether it is beneficial or detrimental to performance) would have been a valid strategy. Unfortunately, this strategy is one that lacks engagement of significant psychological resources and does not rely on perseverance/grit. Once started, it was also straightforward for the students to continue to click on different options for

experimentation. This behavior falls firmly into the effectuating mind. Unfortunately, given the definition of persistence used in this study, whether the student was exercising perseverance/grit in this theme was inconclusive.

The connection with the resilient mind appears obvious at first glance. One would expect that more perseverance/grit should translate to more resiliency. However, the non-cognitive skill of resiliency and coping is identified as a distinctly different non-cognitive skill than perseverance/grit in the literature. As previously discussed in the literature review, the non-cognitive skill of resilience and coping is defined as the management of emotions during the process of adapting to challenging circumstances while working to complete difficult tasks. While resilience and coping rely on controlling emotions when working through short term challenges, perseverance/grit appears to be tied to achieving longer-term goals despite difficulties. Based on these definitions and the evidence seen in this study, perseverance/grit could be defined as a long-term cognitive skill that drives action while resilience and coping can be defined as a short-term cognitive skill that limits the impact of reacting to circumstances. The non-cognitive skill of resilience and coping keeps emotions under control in the moment, while perseverance/grit is driving action towards the longer-term goals. Perhaps these two non-cognitive skills include elements of the same core skill exercised in different forms, under slightly different conditions or over different periods of time. While there is not enough evidence in this study to make this claim, it may be an interesting avenue for future research. Additionally, the researcher also wanted to note that in the case of perseverance/grit, it appears to be tied to the effectuating mind more strongly than the resilient mind. However, the strength of the evidence for each was not the goal for the study and leaving this distinction for future study is best.

Based on the identified themes and behavior collected in this study, the researcher feels that it is fair to say that the non-cognitive skill of perseverance/grit is linked to both the resilient and effectuating minds.

Table 5.3

Which entrepreneurial minds are linked with perseverance/grit?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Persever- ance/grit	-	-	-	X	X

5.2.2 Self-control.

As previously discussed in the literature review, Baumeister, Vohs, and Tice, (2007) define **self-control** as the “capacity for altering one’s own responses, especially to bring them into line with standards such as ideals, values, morals and social expectations, and to support the pursuit of long-term goals” (p. 5). The researcher notes relationships between this definition and behaviors observed with the gameplay under the RS – Frustration code as well as the EM – Fast for Cash code. Themes that also seemed to be linked to self-control were identified amongst both the risk management and resilient mind interview responses. These themes include: *Debt aversion*, *risk aversion*, and *emotional management*. It appears the non-cognitive skill of self-control is linked to both the resilient and effectuating minds. Both Geldhof et al. (2014) and Aditya (2020) argued that there is a link between self-control and entrepreneurial intent. Finding a relationship between self-control and the effectuating mind in this study supports their previous work.

The theme of *debt aversion* was identified due to students avoiding debt whenever possible and paying debt back quickly when they were forced to take out a loan by the game’s

interface. Debt itself can have negative connotations associated with it, so perhaps this behavior was driven by the student's previous knowledge and experience with debt. The avoidance of debt and immediate focus on reducing or eliminating it when possible seemed to be a natural response to being forced to take out debt by the game's interface. While this theme was identified under the risk management mind the student's behavior within this theme did not seem to demonstrate that self-control was being exercised.

The theme of *risk aversion* was identified due to students saying their in-game goal was not to go bankrupt. Students were afraid of losing while they played the game and based their initial goal on this fear. This fear also caused uncertainty as the students approached in-game tasks with apprehension. The risk averse behavior and anxiety indicated by the students is logical to the researcher given that it was the student's first time playing the game and the fact that their gameplay was being recorded. However, despite this anxiety the students continued to play the game. They controlled their response and displayed self-control to align their behavior with the goals of the game. This theme seemed strongly tied to the risk management mind and the behavior also evidenced self-control.

The theme of *emotional management* was identified when students experienced frustration in the game but continued to play without getting angry or quitting. Additionally, the theme of persistence and continued activity was identified due to students continuing to attempt different in-game actions and repeating the same actions in game, particularly when they did not have the predicted effect. The students predicted an effect in the game and when things did not go as planned, they did not panic. The students could have walked away from the game at any time but controlled their emotions and behavioral response, continuing to play even when they became frustrated. The behavior when frustration was evident provided support for students exercising

self-control. This emotional control allowed them to continue to make decisions and take action in the game. These themes seemed strongly tied to the resilient mind and the behavior within them also displays self-control.

The researcher also notes parallels between this non-cognitive skill and the non-cognitive skill of perseverance/grit being defined as pursuing “long term or higher order goals in the face of challenges and setbacks, engaging the student’s psychological resources, such as their academic mind sets, effortful control, and strategies and tactics” by Shechtman et al. (2013, p. 3). Self-control also appears similar to the management of emotions during the process of adapting to challenging circumstances while working to complete difficult tasks, which is the definition of the non-cognitive skill of resiliency and coping. However, there is an important difference between these definitions. Self-control is focused on altering one’s own responses to align with ideals, values, morals, and social expectations that are potentially set by others while perseverance/grit is focused on advancement towards goals set by the individual when conditions are unfavorable. Resiliency and coping is focused only on the emotional response to challenges and does not require this response to be conducive to achieving goals set by the individual or others. Given that these skills are so closely tied together, perhaps there is a common element that students rely upon to exercise any of these three skills. Investigating this common element could be an opportunity for future study.

Based on the identified themes and behavior collected in this study, the researcher feels that it is fair to say that the non-cognitive skill of self-control is linked to both the risk management and resilient minds.

Table 5.4

Which entrepreneurial minds are linked with self-control?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Self-control	-	-	X	X	-

5.2.3 Social skills.

As previously discussed in the literature review, Welsh and Bierman (1998) define **social skills** as “an individual’s knowledge of and ability to use appropriate social behaviors that are pleasing to others in interpersonal situations” (p. 7). The researcher notes relationships between this definition and the behaviors observed with the gameplay under the RS – Frustration code. A singular theme that also appeared linked to social skills was identified amongst the resilient mind interview responses. This theme was *emotional management*. Evidence collected in this study does not show a relationship between the non-cognitive skill of social skills nor any of the entrepreneurial minds.

The theme of *emotional management* was identified as students experienced frustration in the game but continued to play without getting angry or quitting. The researcher notes that withholding a response to frustrating events is often associated with social skills but based on the evidence in this study, the researcher cannot conclude that social skills were utilized. The evidence was collected by observing the students did not include interaction with other people. Since the definition used emphasizes that appropriate social behaviors are pleasing to other people, no connection between social skills and the entrepreneurial minds can be claimed by this study.

The definition of social skills used in this study implies that social skills are involved in the application of several other cognitive/non-cognitive skills including response inhibition,

metacognition, speed of information processing and multiple simultaneous attention. Investigation of the cognitive/non-cognitive skills that contribute to social skills would be an avenue for future study.

Based on the identified themes and observed behavior collected in this study, the researcher feels that it is fair to say that the non-cognitive skill of social skills cannot be linked to any of the entrepreneurial minds. Notably, this does not negate the possibility of a connection but simply acknowledges that evidence to support a connection was lacking in this study.

Table 5.5

Which entrepreneurial minds are linked with social skills?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Social skills	-	-	-	-	-

5.2.4 Resilience and coping.

As previously discussed in the literature review, the non-cognitive skill of **resilience and coping** is defined as the management of emotions during the process of adapting to challenging circumstances while working to complete difficult tasks.

The theme *impact of the game’s user interface* was identified because many of the options containing useful information were in different menus, and the game would sometimes force students to choose an action to remediate a situation without the student being aware of the possible consequences. The game interface for Capitalism Lab has many options and, for a new player, this interface appeared difficult to navigate and was somewhat overwhelming for the students. Additionally, the students lacked awareness of the information that was available to them (though this was not their fault) in order to make decisions in-game. Though the students played

through a small portion of the tutorial, they did not learn about all of the options available to them from the tutorial and instead had to decide during gameplay how to cope with in-game situations using the interface. The interface itself, coupled with the student's inexperience, occasionally caused challenging situations to arise. The students were forced to cope with these situations to the best of their in-game ability. The students managed their emotions as they played the game and dealt with the interface. While this theme was identified under both the designing and effectuating minds, the behavior within this theme cannot be said to demonstrate definitively that resiliency and coping was being exercised in these minds. The resilient behavior identified under this theme was necessary because of both the complexity of the user interface and the user's inexperience with it. For this reason, rather than linking the behavior with the designing and effectuating mind, the researcher placed this behavior into the resilient mind.

The theme *awareness of risk taking* was identified because students indicated that they knew they could lose money when making specific decisions in the game and needed to manage that risk. An awareness that each decision made in-game has consequences indicates a potential emotional response to those consequences, whether they are favorable or unfavorable. In this case, the students were sensitive to negative consequences because they did not want to lose the game. Specific examples of students inhibiting an emotional response emerged when a student ran out of cash and the game's interface forced them to make a specific decision about how they would raise enough cash to continue in the game. This clear negative consequence of selling businesses or land caused an emotional response which the students controlled. The students made a decision and continued to play. While this behavior was originally identified under the risk management mind, the student's behavior within this theme appeared to demonstrate resiliency and coping, as well as connecting the risk management mind with the resilient mind.

The theme of *feeling committed to the experience* stemmed from the fact that all the students played the game for the full amount of time, continuing to attempt to succeed in the game. The theme of *emotional management* was identified due to students experiencing frustration in the game but continuing to play without getting angry or quitting. Given that students managed their emotions over an extended time period, the behavior within both of these themes demonstrated links to resilience and coping even when frustration was encountered. These themes were identified under the resilient mind and the student's behavior within these themes suggested that resiliency and coping was being exercised.

The theme of *regrouping* was noted when the students attempted to reset their progress (as much as they could) when they made a specific decision that negatively impacted their gameplay. If the student's perception of an action in game was negative, they began to act towards either undoing the action completely or mitigating its impact on their future gameplay. This process involved recognizing that the decision they had made was having a negative impact, while simultaneously keeping their emotions under control to make the next decision. Additionally, students continued to attempt different actions following a poor decision. This behavior was originally identified under the resilient mind and the student's behavior within this theme suggested that resiliency and coping was utilized as well as connecting the effectuating mind with the resilient mind.

The theme of *instinct-based evaluation of in-game performance* was identified because students evaluated their own performance in the game, deciding if they were performing well or not (in real-time) based on their experience with the game. The theme of *action motivated by the in-game situation* was identified because students would adjust the speed of the game (according to the information they gathered) to allow more time to make decisions or to speed up time to see

the effects of a decision. Following these adjustments to the speed of the game, the students would then act according to their perception of the situation they were in. Particularly when students ran out of cash, the game would force their hand into taking an action. Regardless of whether the action was by choice or forced by the interface of the game, the students appeared to evaluate their own performance continuously as they played. Their perception of their own performance drove their next action. This was also their first time playing the game and they searched for specific information from the interface that was familiar to them and they felt that this information could be used to measure their performance. However, exactly what information the students relied upon within the game was unclear. Students also indicated that they felt like they were doing well but had difficulty explaining why they felt their performance was satisfactory. These two themes were originally identified under the resilient mind and effectuating mind; however, the behavior did not adequately demonstrate that resilience and coping was being exercised.

The themes of *stubbornness* and *persistence and continued activity* were observed when students continued to attempt a variety of in-game actions and then repeated each action several times, particularly when the action did not have the predicted effect. The researcher feels that it is likely that the students were repeating their actions due to their inexperience with the game and not so that they could cope with activities that failed to achieve desired or predicted results. These two themes were originally identified under the resilient mind; however, it was not conclusive that the behavior demonstrated resilience and coping.

The theme of *actions reduce uncertainty* was identified when students indicated that they felt better when taking action and then evaluated the effectiveness of that action, rather than considering the effectiveness before the action was taken. The theme of *bias towards action* was

identified due to students pursuing action in game rather than spending time strategizing. Based on the behavior observed in these two themes, taking action in the game seemed to be a way to cope with the game's lack of familiarity while repeating actions (identified under the themes of *stubbornness* and *persistence and continued activity*) and was likely because of their inexperience. The students coped with this uncomfortable feeling by pursuing actions in the game. These two themes were identified under the resilient and effectuating minds and may suggest resilience and coping.

The behavior identified for resiliency and coping highlighted the interdependency of the entrepreneurial minds. If students lacked ability in one of the minds, it could cause difficulty with behavior(s) related to another mind, while strong ability could potentially counteract weakness in another area. There was also a relationship between resiliency and coping and other cognitive/non-cognitive skills, indicating some level of interdependence. Interestingly, Korber and McNaughton (2018) also found links between resilience and other skills including coping ability, risk mitigation, self-efficacy, optimism, adaptive capacity, and persistence. This finding further reinforces Lee and Wang (2017) who also argue for links between entrepreneurial resilience and other traits/skills including: self-efficacy, motivation, and persistence. Furthermore, a hierarchy within the entrepreneurial minds may exist with behavior that falls under the resilient mind only being necessary to support the other minds when a risk taken did not pay off or an opportunity seized did not have the originally perceived value. The resilient mind comes into play when failure is encountered. This supports previous research from Corner, Pavlovich, and Singh (2017) as they investigated links between resilience and entrepreneurship as well as how entrepreneurs cope following the failure of an entrepreneurial venture. Perhaps the resilient mind is a small part of each of the other minds with resiliency and coping being connected with all five of the

entrepreneurial minds. This could be an interesting avenue for future research. Based on the evidence gathered within this study, resiliency and coping relates to four of the five entrepreneurial minds, with no observed relationship to the opportunity recognition mind.

Table 5.6

Which entrepreneurial minds are linked with resilience and coping?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Resilience and coping	-	X	X	X	X

5.2.5 Self-perception.

As previously discussed in the literature review, **self-perception** is defined as a person's concept of their own abilities and beliefs about their own capability to influence their circumstances.

The theme of *opportunity from focusing on in-game details* was identified due to students' identifying the Consumer Traffic Index (CTI) number that was attached to different locations. The theme of *exploiting one game mechanic* was noted when students identified an opportunity in game to adjust the sale price of their items in comparison to the city average. Student E took advantage of both game mechanics. These small details had a significant impact on the profitability of a business started in the game, and the students that focused on these specific details benefited from their sensitivity to the minutiae. The students who took advantage of such mechanics influenced the game in their favor quickly, resulting in better performance due to their clever identification and use of game mechanics. This behavior directly resulted in these students earning increased market share and profit in the game. While the behavior in these themes is not

directly connected to general self-perception outside of the game, both themes demonstrated that self-perception of their abilities in game could be influenced by their performance. If the students performed well while playing the game (i.e., being reasonably successful with the game), they believed they were good at the game in general. While these themes were identified under the opportunity recognition mind the students' behavior within these themes did not seem to demonstrate that self-perception was being purposefully exercised, though their gameplay performance seemed to have an influence on self-perception.

The theme of *difference between strategy and execution* was identified when students reported feeling like they had a strategy while simultaneously encountering difficulty with executing it. Students perceived themselves to be competent and aware of a strategy they felt would work in the game. Unfortunately, they encountered problems with bringing this strategy to fruition and had difficulty explaining their strategy. For example, Students A and C identified getting into mining as a good strategy, but neither of these students successfully placed a mine. Their perception of good strategy in the game was incongruent with their actions. While this theme was identified under the designing mind, the student's behavior within this theme indicated that self-perception was being exercised.

The theme of the *role of prior knowledge and instinct* was identified when students indicated that they were interacting with certain aspects of the game based on what they knew about that aspect from their personal experiences. A few specific examples of in-game information included examining the profit/loss bar and deciding whether to advertise or not based on their previous experience. Personal knowledge affected gameplay decisions and while students may not have reflected on their own knowledge, it is apparent that they felt that their previous knowledge was good enough upon which to base their decisions. The students were likely unaware that they

were exercising self-perception while making decisions in this way. Interview data and in-game observation shows this, and it was common for all students. For example, Student D responded:

Student D: “I started with uh just a retail store. And then I was just uh picking things that just looked like the, the demand was high so I could uh...”

While this theme was identified under the opportunity recognition mind the student’s behavior within this theme suggests that self-perception was being exercised.

The theme of *prior knowledge dictates strategy* was identified due to students basing their strategy of their previous knowledge of an aspect of the game. A main example of prior knowledge being used to determine strategy was related to whether students chose to advertise at a store. The students used their previous knowledge of advertising and how it is used by real businesses to decide whether to advertise in the game. In this theme, students based their strategy on their perception of their previous knowledge which was similar to the behavior seen in the theme of *role of prior knowledge and instinct*. The students were likely unaware that they were exercising self-perception while making decisions in this way, and it was common for all students. While this theme was identified under the designing mind the student’s behavior within this theme seemed to demonstrate that self-perception was being exercised.

The theme of *action motivated by the in-game situation* was identified because students would adjust the speed of the game according to information they gathered, which would allow more time to make decisions or speed up time to see the effects of a decision. Following this adjustment of game speed, the students would then act according to their perception of the situation. While this theme was identified under the effectuating mind, the student’s behavior within this theme suggested that self-perception was being exercised.

The theme of *uncomfortable confidence* was identified when students exhibited confidence in the decisions they made at the time – even though they were nervous it would be unsuccessful. Students were aware of their inexperience but decided to rely on the skills that they believed they possessed. Awareness of their own abilities indicates exercising self-perception. Additionally, self-perception was necessary for the students to make the decision to trust their own capabilities. While this theme was identified under the effectuating mind the student’s behavior within this theme seemed to demonstrate that self-perception was being exercised.

Self-perception can affect both how planning for entrepreneurship occurs and the action that the entrepreneur takes. Based on the evidence observed in this study, it is plausible to suggest that self-perception is connected to both the designing and effectuating minds. This also supports Ceresia and Mendola’s (2020) indication that self-perception is related to entrepreneurial intent.

Table 5.7

Which entrepreneurial minds are linked with self-perception?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Self-perception	-	X	-	-	X

5.2.6 Creativity.

As previously discussed in the literature review, **creativity** is defined using Plucker et al.’s (2004) definition with a slight modification, as the production of a product, *plan, or service* that is novel and useful in a social context, based on the individual or group’s aptitudes, processes and operating environment. Unfortunately, since students were playing a game with pre-

defined constraints on their actions, creativity in this context was limited. However, some examples were observed where a student creatively utilized a game mechanic to gain an advantage.

Two themes were identified. The theme of *opportunity from focusing on in-game details* was when students identified the Consumer Traffic Index (CTI) number that was attached to different locations. The theme of *exploiting one game mechanic* was identified when students identified an opportunity in game to adjust the sale price of their items in comparison to the city average. These instances of discernment and use of game mechanics directly resulted in earning both more market share and profit in the game.

The behavior seen within this theme demonstrates use of creativity to gain an advantage in game. Creativity is defined in this study as a product, plan or service that is novel and useful in a social context. Exploiting a single game mechanic in a creative way demonstrates the link between the opportunity recognition mind and creativity. Although evidence that creativity was linked with the other minds in this study was lacking, it is possible that there are links between creativity and the other entrepreneurial minds. This supports Ward's (2004) conclusion that the entrepreneur "must generate valuable ideas for new goods or services that will appeal to some identifiable market, and having identified those potential opportunities, [the entrepreneur] must figure out how to bring the project to fruition" (p. 174). Fillis and Rentschler (2010) note that a competitive advantage exists for entrepreneurs who are creative, which connects well with opportunity recognition.

Table 5.8

Which entrepreneurial minds are linked with creativity?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Creativity	X	-	-	-	-

5.2.7 Metacognition.

As previously discussed in the literature review, **metacognition** is defined as the knowledge of and ability to regulate and monitor one’s own cognitive processes before, during and after tasks.

The theme of *difference between strategy and execution* was noted when students indicated feeling like they had a strategy while simultaneously encountering difficulty with executing it. Taking into consideration the definition of metacognition, it appears to be reasonable to conclude that being aware of and attempting to implement a strategy towards a goal is indicative of metacognition. Regardless of whether the strategy that was being implemented was successful or not, the students relied on their previous knowledge to engage with the game. However, half of the students (Student A, B, and C) in this study exhibited behavior under this theme while the other half did not. Though these other students did not directly exhibit behavior under this theme, it still seems reasonable to connect metacognition with the opportunity recognition mind based on the behavior in this theme.

The theme of *business placement decision opportunities* was identified when students appeared to recognize the importance of placing businesses in locations with a high level of CTI. As students played the game, being aware of the core game mechanics that influence gameplay provided a distinct advantage to them. Having the presence of mind to attempt to identify these

core gameplay mechanics (i.e., higher levels of CTI translate to higher traffic through the business that was placed, which in turn, ends up with the player earning more money) suggests application of metacognition. Since all students played the tutorial, they had some limited experience with the game and reflected on that experience when they were playing the full game on their own. While this theme was identified under the opportunity recognition mind the student's behavior indicated that metacognition was being exercised.

The theme of *prior knowledge dictates strategy* was identified when students based their strategy on their previous knowledge of an aspect of the game. The theme of the *role of prior knowledge and instinct* was identified when students indicated that they were interacting with certain aspects of the game based on what they knew about that aspect from their personal experiences. A few specific examples of in-game information included examining the profit/loss bar and deciding whether to advertise or not. Based on the definition of metacognition, it seems reasonable to conclude that reflecting on their previous knowledge and its application within the game suggests application of metacognition. This use of their prior knowledge and awareness of using it (whether it helped them positively in game or not) to formulate a strategy was a theme common to all students. While this theme was identified under the designing mind, the student's behavior suggested that metacognition was being exercised.

The theme of *debt aversion* was identified when students were observed avoiding debt whenever possible and paying debt back quickly when they were forced to take out a loan by the game's interface. Like the previous theme of *prior knowledge dictates strategy*, students' previous knowledge of debt drove them to debt-avoidance action in game. However, whether the students were aware of this tendency was unclear, and the researcher feels that had there been stronger evidence that students were aware of their behavior towards eliminating or avoiding

debt, then a connection between metacognition and the risk management mind could have been made. Given the evidence collected in this study, metacognition was not being exhibited in the behavior under this theme.

The theme of *risk aversion* was identified when students said their in-game goal was to avoid bankruptcy. The theme *awareness of risk taking* was identified when students indicated that they knew they could lose money when making a decision in the game and needed to manage that risk. Both themes were indicative of metacognition. Students were aware of the fact that their decisions in game would have consequences, for better or worse. In order to absorb information in the game to determine what was necessary to manage this risk, students played at a leisurely but continuous pace, particularly when they were just starting to play. This leisurely pace allowed the students to reflect on their decisions as they were made, as well as before and after making them. Monitoring of their own decision making relative to the risk involved implies use of metacognition. The researcher acknowledges that some decisions might have been made without much thinking about the consequences beforehand (since the students were new to the game), the regulation of future decision making based on the consequences of those initial decisions is still enough evidence to claim that metacognition was being exercised. While these themes were identified under the risk-management mind, the student's behavior suggested that metacognition was being exercised.

The theme of *regrouping* was identified due to student's attempting to reset their progress (as much as they could) when they made a decision that negatively impacted their gameplay. All of the students found themselves in unfamiliar territory as they played the game. Recognizing that a potential mistake was made required careful attention to the decisions they were making and the consequences of those decisions. Additionally, the theme of *instinct-based evaluation of*

in-game performance was identified because students evaluated their own performance in the game, deciding if they were performing well or not based on their experience with the game. This was also their first time playing the game, and it is likely that they looked for specific information from the interface that could be used to measure their performance; exactly what this information would have been was unclear. Students indicated that they felt like they were doing well, but had difficulty explaining why they felt that way. Because students had difficulty explaining why they were doing well, it is possible that the behavior under the regrouping theme was coincidental. While these themes were identified under the resilient mind, evidence for metacognition was lacking.

Metacognition can influence both how entrepreneurs identify opportunities and their strategy on how to exploit these opportunities. This adds credibility to Cox’s (2016) claim that relationships exist between metacognition and opportunity recognition. Based on the evidence observed in this study, it seems reasonable to connect metacognition with the opportunity recognition and designing minds.

Table 5.9

Which entrepreneurial minds are linked with metacognition?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Metacognition	X	X	-	-	-

5.2.8 Motivation.

As previously discussed in the literature review, **motivation** is defined as the performance of an activity for either the inherent pleasure or an external reward that results from

performing the activity. In this study, rewards would have been earned in game (i.e., “winning” at the game), rather than outside of gameplay.

The theme of *seeking in-game knowledge* was identified when students appeared to be looking for crucial aspects that they could take advantage of in the game. Spending time looking for the crucial aspects that influenced gameplay indicates that students were motivated to find out how to succeed in the game. Looking for opportunities in game that would make things easier for them required both attention to the details and motivation. This theme was identified in the opportunity recognition mind and indicates that motivation was being exercised.

The theme of *feeling committed to the experience* emerged from observations of the students playing the game for the full amount of time, while trying to be successful. Regardless of their reason for doing so, continuing to play the game and attempting to be successful required motivation. The personal rewards for each student were not clear from the gameplay; however, they behaved as though it was worth it for them to expend energy on doing the best they could in the game. This theme was identified as evidence of the resilient mind and indicates that motivation was being exercised.

The themes of *stubbornness* and *persistence and continued activity* were identified when students continued to attempt a variety of in-game actions and then repeating each action several times, particularly when the action did not have the predicted effect. The theme of *feeling of urgency* was identified when students continued to attempt to take action for the full amount of time that they played the game. The theme of *action motivated by the in-game situation* was identified because students would adjust the speed of the game according to information they gathered, which would allow more time to make decisions or speed up time to see the effects of a decision. Following this adjustment of game speed, the students would then act according to their

perception of the situation. Furthermore, the game would also require students to make certain decisions to keep them moving. For example, if they ran out of cash, they would need to decide how to raise cash by either taking out a loan or selling existing assets. Students were driven to perform well in the game and continued to take action to do so, but exactly why was not clear. However, from the evidence seen in these themes, students took continuous action, predicted certain effects when they acted and when the desired effects did not materialize as results, they would try the behavior again. The students appeared motivated to succeed in the game and were sometimes motivated by the game itself. Furthermore, they were motivated to take action while in the game, as indicated by repeated attempts to perform different in-game actions and constant clicking of the computer mouse. These themes were identified in the resilient and effectuating minds and indicated that motivation was being exercised.

Motivation can influence how entrepreneurs identify opportunities, bounce back from adversity, and act towards their goals. Based on the evidence observed in this study, it seems reasonable to connect motivation with the opportunity recognition, resilient and effectuating minds. This also support research from Lee and Wang (2017) about the existence of links between entrepreneurial resilience and other traits/skills including: self-efficacy, motivation, and persistence.

Table 5.10

Which entrepreneurial minds are linked with motivation?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Motivation	X	-	-	X	X

5.3 Cognitive Skills

For this study, cognitive skills are defined by Liu (2003) as “mental skills [that are] broadly ranged from memory skills to procedural skills, from language skills to reasoning skills” (p. 1). The cognitive skills investigated in the discussion included: sustained attention, response inhibition, speed of information processing, cognitive flexibility and control, multiple simultaneous attention, working memory, category formation, and pattern recognition.

5.3.1 Sustained attention.

As previously discussed in the literature review, **sustained attention** is defined as the ability to examine, focus on, and think about tasks over a period of time based on the context of the task and motivation for completing it.

The theme of *opportunity from focusing on in-game details* was identified when students identified the Consumer Traffic Index (CTI) number that was attached to different locations. The theme of *business placement decision opportunities* was identified when students appeared to recognize the importance of placing businesses in locations with a high level of CTI. This small detail has a significant impact on the profitability of a business started in the game and the students that focused on this specific detail benefited from their sensitivity to it. Noting the importance of the CTI required students to focus and then think about its relevance to the game, particularly at the start of gameplay. Taking advantage of the game mechanics required the students to scrutinize and judge which aspects of the user interface were important. These themes were identified in the opportunity recognition mind and indicates that sustained attention was being exercised. However, once students learned which features were important, they could devote less mental capacity to focusing on this.

The theme of *exploiting one game mechanic* was identified when students identified an opportunity in game to adjust the sale price of their items in comparison to the city average. This clever identification and use of game mechanics directly resulted in these student's earning both more market share and profit in the game. This behavior required sustained attention: the students not only had to recognize that doing this would allow them to earn more profit (only Student E really took advantage of this). It also required the students to identify the feature in the interface. This feature was not difficult to find (as only Student A missed this feature) though its importance was not obvious. This theme was identified in the opportunity recognition mind and indicates that sustained attention was being exercised.

The theme *impact of the game's user interface* was identified because much of the information was located in different menus and the game would sometimes force students to choose an action to remediate a situation without the student being aware of the possible consequences. Since it was their first time playing the game, paying careful attention to the interface required significant attention as the students attempted to figure out where different options were located and how to succeed. The user interface of the game was not intuitive for the students. Though the students all played through the tutorial, it was apparent that they needed to focus their attention as they built businesses and selected products for sale. It appears that even navigating to the correct location to start businesses and select products was sometimes problematic for the students. The students also needed to pay careful attention to a significant amount of information as they decided where to place businesses, which options were important and which products to sell. Even once the businesses were set up, much information was available for the students. The students needed to exercise substantial focus to sift through the abundance of information. When the game forced action on students after the students ran out of cash, for example, Student B was

the only one who did not run out of cash during their gameplay at any point. This forced the students to focus on strategizing an appropriate course of action. This theme emerged in both the opportunity recognition and effectuating minds and indicates that sustained attention was being exercised.

Sustained attention seems to have an effect on both how entrepreneurs identify opportunities and the action they take to exploit these opportunities. Based on the evidence observed in this study, it is reasonable to connect sustained attention with the opportunity recognition and effectuating minds.

Table 5.11

Which entrepreneurial minds are linked with sustained attention?

	Opportunity Recognition Mind	Designing Mind	Risk Management Mind	Resilient Mind	Effectuating Mind
Sustained attention	X	-	-	-	X

5.3.2 Response inhibition.

As previously discussed in the literature review, **response inhibition** is defined as the ability to prevent or stop a response to distractions.

The theme *impact of the game's user interface* was identified because much of the information was located in different menus and the game would sometimes force students to choose an action to remediate a situation without the student being aware of the possible consequences. The theme of *emotional management* was identified when students expressed frustration in the game but continued to play without getting angry or quitting. The behaviors observed in these themes were particularly related to response inhibition when the student's actions generated negative consequences in game which resulted in the students suppressing their reaction as they tried

to mitigate the effects of a poor decision. These themes emerged in the designing, resilient and effectuating minds and suggested that response inhibition was being exercised.

The themes of *stubbornness* and *persistence and continued activity* were observed when students continued to attempt a variety of in-game actions and then repeated each action several times even when the action did not have the predicted effect. Rather than initially reacting to the unsuccessful attempt, students decided to try to repeat the action immediately. Additionally, the theme of *actions reduce uncertainty* was identified when students indicated that they felt better taking action and then evaluating the effectiveness of that action, rather than considering the effectiveness before the action was taken. Duplicating actions and describing feeling better after taking those actions in game indicates an application of response inhibition. By continuing to take and repeat actions that they felt were important in game, students appeared to reduce the anxiety they felt about their performance in a game that was brand new to them. These themes emerged in the resilient and effectuating minds and indicated that response inhibition was being exercised.

Response inhibition seems to have an effect on how entrepreneurs develop their strategy, how they refocus after challenges, and how they take action towards challenges. Based on the evidence observed in this study, it is reasonable to connect response inhibition with the designing, resilient and effectuating minds.

Table 5.12

Which entrepreneurial minds are linked with response inhibition?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Response inhi- bition	-	X	-	X	X

5.3.3 Speed of information processing.

As previously discussed in the literature review, **speed of information processing** is defined as how quickly a learner can process new information and act upon it.

The theme of *opportunity from focusing on in-game details* was identified when students identified the Consumer Traffic Index (CTI) number that was attached to different locations. This small detail has a significant impact on the profitability of a business started in the game and the students who focused on this specific detail benefited from their sensitivity to it. The theme of *seeking in-game knowledge* was identified when students searched for crucial aspects that could be taken advantage of to perform well in the game. This was their first time playing the game, quickly identifying important information in the game that could be taken advantage of indicates use of the speed-of-information-processing skill especially given the amount of information available in the interface. These themes emerged in the opportunity recognition mind and indicated that speed of information processing was being exercised.

The theme of the *role of prior knowledge and instinct* was identified when students indicated that they were interacting with certain aspects of the game based on what they knew about that aspect from their personal experiences. A specific example of information examined by students in-game and relying on their previous knowledge was the profit/loss bar. The theme of *prior knowledge dictates strategy* was identified when students based their strategy on their previous knowledge of an aspect of the game. A main example of prior knowledge being used to determine strategy was related to whether students chose to advertise at a store. Recognizing situations where their prior knowledge could be applied to improve performance required quick information processing. Judging which information was going to be useful and then implementing it into their gameplay required fast decision making. These themes are compatible with the

opportunity recognition and designing minds and indicated that speed of information processing was being exercised.

The theme of *regrouping* was identified when students attempted to reset their progress (as much as they could) when they made a decision that negatively impacted their gameplay. The theme of *instinct-based evaluation of in-game performance* was identified because students evaluated their own performance in the game, deciding if they were performing well or not based on their experience with the game. This was also their first time playing the game, so it is likely that they looked for specific information from the interface that could be used to measure their performance—but exactly what this information would have been was unclear. Students indicated that they felt like they were doing well, but had difficulty articulating why they felt that way. Evaluating their own performance while playing a game in which they lacked experience required quick thinking. When students judged their own actions as causing negative consequences, they needed to process information quickly to address the undesirable situation. These themes emerged in the resilient mind and suggested that speed of information processing was being exercised.

Speed of information processing can influence how entrepreneurs identify opportunities, how they develop their strategy to exploit these opportunities, and how they manage challenges. Based on the evidence observed in this study, it seems reasonable to connect speed of information processing with the opportunity recognition, designing, and resilient minds.

Table 5.13

Which entrepreneurial minds are linked with speed of information processing?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Speed of infor- mation pro- cessing	X	X	-	X	-

5.3.4 Cognitive flexibility and control.

As previously discussed in the literature review, **cognitive flexibility and control** is defined as the ability to quickly redirect cognitive resources to approach a new situation.

The theme of *difference between strategy and execution* was identified when students indicated feeling like they had a strategy while simultaneously encountering difficulty with executing it. The theme of the *role of prior knowledge and instinct* was identified when students indicated that they were interacting with certain aspects of the game based on what they knew about that aspect from their personal experiences. A few specific examples of in-game information included examining the profit/loss bar and deciding whether to advertise or not. The students relied on their previous knowledge to formulate strategies, but because of the interface they occasionally encountered difficulties with implementing their strategies. Attempting to implement their strategies in an unfamiliar environment (i.e., where the results were not guaranteed) required cognitive flexibility and control as the students needed to adjust their next action based on the results of their initial behavior. These themes emerged in the opportunity recognition and designing minds and indicated that cognitive flexibility and control was being exercised. However, based on the behavior observed, the researcher feels that while cognitive flexibility and control was utilized, the connection to these two minds is too weak to claim that cognitive flexibility and

control is connect with the opportunity recognition and designing minds. As cognitive flexibility and control is defined, it seems to require more evidence that this connection exists.

The theme of *emotional management* was noted when students expressed frustration in the game but continued to play without getting angry or quitting. The theme of *stubbornness* was identified when students continuously attempted a variety of in-game actions and then repeated each action several times, particularly when the action did not have the predicted effect. The theme of *regrouping* was identified when students attempted to reset their progress (as much as they could) when they made a decision that negatively impacted their gameplay. These three themes required the students to exercise control over their behavior when decisions that were made in game did not turn out as predicted. By shifting their focus from being proactive to reactive, the students demonstrated their cognitive flexibility and control. These themes emerged in the resilient mind and indicated that cognitive flexibility and control was being exercised.

The theme of *instinct-based evaluation of in-game performance* was identified because students evaluated their own performance in the game, deciding if they were performing well based on their experience with the game. The theme of *action motivated by the in-game situation* was identified because students would adjust the speed of the game according to information they gathered, which would either allow more time to make decisions or speed up time to see the effects of a decision. Following this adjustment of game speed, the students would then act according to their perception of the situation they were in. This was also their first time playing the game and it is likely that they looked for specific information from the interface that they could use to measure their performance—but exactly what this information would have been was unclear. Students indicated that they felt like they were doing well, but had difficulty explaining why they felt that way. Constantly monitoring their own performance and making decisions

about what actions to take next while playing a game where they lacked experience required the students to exercise cognitive flexibility and control. Since they were unable to accurately predict the consequences of their actions, they needed to be able to redirect their focus to a new piece of information or task to move forward in the game. The researcher notes that regardless of whether students were aware that they were exercising cognitive flexibility and control, the skill was being exhibited consistently during this behavior as they adapted while playing the game. These themes emerged in the resilient and effectuating minds and indicated that cognitive flexibility and control was being exercised.

Cognitive flexibility and control can influence both how entrepreneurs handle challenges and direct action towards handling adversity. Based on the evidence observed in this study, it seems reasonable to connect cognitive flexibility and control with the resilient and effectuating minds.

Table 5.14

Which entrepreneurial minds are linked with cognitive flexibility and control?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Cognitive flex- ibility	-	-	-	X	X

5.3.5 Multiple simultaneous attention.

As previously discussed in the literature review, **multiple simultaneous attention** is defined as the ability to direct attention towards, redirect attention between and complete two or more tasks at the same time.

The theme of the *role of prior knowledge and instinct* was identified when students indicated that they were interacting with certain aspects of the game based on what they knew about

that aspect from their personal experiences. A few specific examples of in-game information included examining the profit/loss bar and deciding whether to advertise or not. Searching the interface for information that they had previous knowledge about, compared to options with which they were unfamiliar required use of multiple simultaneous attention. At the same time they were scanning the interface and making business decisions, the students also needed to pay attention to the computer player's decisions. This theme emerged in the opportunity recognition mind and indicated that multiple simultaneous attention was being exercised.

The theme *impact of the game's user interface* was identified because many options and information were located in different menus and the game would sometimes force students to choose an action to remediate a situation without the student being aware of the possible consequences. The theme of *attempts to differentiate* was identified when students attempted to build a business that was different than their previous business, repeatedly. The theme of *lack of attention to detail* was identified when students attempted to place businesses when they lacked the resources to do so. The behavior in these three themes demonstrated the amount of information the students needed to process to play the game. All the students had a significant number of different options for the types of businesses that they could create as well as a wide variety of products to choose from. Deciding which business to select, where to place it, which products to sell and how much to sell each product for, while considering the impact of the computer's choices of businesses/products and finding these options within the interface required use of multiple simultaneous attention. These themes emerged in the designing and effectuating minds and suggested that multiple simultaneous attention was being exercised.

Though the themes discussed above indicated use of multiple simultaneous attention in the opportunity recognition, designing, and effectuating minds, based on the definition it is

difficult to imagine a situation where a person playing a game they had not played before would not be continuously utilizing multiple simultaneous attention. Once a player has spent more time playing the game they would not need to apply this cognitive skill as often, but when they are learning a complex game multiple simultaneous attention would be used often. Therefore, the researcher felt it was prudent to not connect multiple simultaneous attention with any of the entrepreneurial minds based on the evidence gathered in this study. The researcher wants to emphasize that this does not mean that a connection does not exist, but simply acknowledges that the evidence gathered in this study was not strong enough to support connecting a specific mind when the skill would have been applied by the player constantly as they learned the game.

Table 5.15

Which entrepreneurial minds are linked with multiple simultaneous attention?

	Opportunity Recognition Mind	Designing Mind	Risk Management Mind	Resilient Mind	Effectuating Mind
Multiple simultaneous attention	-	-	-	-	-

5.3.6 Working memory.

As previously discussed in the literature review, **working memory** is defined as the ability to direct attention to keep, process and use information in a short period of time to perform tasks.

The theme of *opportunity from focusing on in-game details* was identified when students took advantage of the Consumer Traffic Index (CTI) number that was attached to different locations. This small detail has a massive impact on the profitability of a business started in the game and the students that focused on this specific detail benefited from their sensitivity to it. Once this detail was noticed, the students realized (by processing in working memory) that this would

be a useful game mechanic that they could take advantage of. However, once this processing was complete, working memory was no longer required for this specific detail but would have been utilized by the student for other details in the game interface. Students would use working memory as needed during gameplay to process small details and either identify their importance or discard them as unnecessary.

The theme of *exploiting one game mechanic* was identified when students identified an opportunity in game to adjust the sale price of their items, in comparison to the city average. This clever discernment and use of game mechanics directly resulted in these student's earning both more market share and profit in the game. Initially, noticing and then exploiting this game mechanic required use of working memory. However, once the students became accustomed to the game mechanic, then they no longer needed to rely upon working memory to perform the task in-game. This theme emerged in the opportunity recognition mind and suggested that working memory was being exercised. However, later in gameplay this connection seemed to disappear.

The theme of *business placement decision opportunities* was identified when students recognized the importance of placing businesses in locations with a high level of CTI and remembered that the value of CTI was linked to the profitability of the business. The theme of the *role of prior knowledge and instinct* was identified when students indicated that they were interacting with certain aspects of the game based on what they knew about that aspect from their personal experiences. A few specific examples of in-game information included examining the profit/loss bar and deciding whether to advertise or not. This behavior indicates storage of the information in their working memory and comparison of that information with their previous memories. Once they realized that they already had some knowledge about the area and that they could apply that knowledge in the game, working memory was no longer necessary.

Though the previous themes identified in this section were found under several of the entrepreneurial minds, one thing was common between them: students would use working memory as needed during gameplay to process small details and either identify their importance or discard them as unnecessary. Once working memory had been used to decide if something was important, it was no longer needed. Claiming a specific link between working memory and any of the entrepreneurial minds remains out of reach without further evidence.

Table 5.16

Which entrepreneurial minds are linked with working memory?

	Opportunity Recognition Mind	Designing Mind	Risk Management Mind	Resilient Mind	Effectuating Mind
Working memory	-	-	-	-	-

5.3.7 Category formation.

As previously discussed in the literature review, **category formation** is defined as the ability to organize information, concepts and skills into categories either unconsciously or through a deliberate process in order to simplify processing of stimuli in the environment.

The theme *impact of the game's user interface* was identified because much of the information was located in different menus and the game would sometimes force students to choose an action to remediate a situation without the student being aware of the possible consequences. The students did not investigate most of the different menus present in the game, instead sticking to the main options to place businesses. This formation of two categories by the student (essentially relevant and irrelevant options) indicates application of category formation, albeit unconsciously as the students did not seem to indicate an awareness of doing this. This theme emerged in both the opportunity recognition and effectuating minds and suggested that category formation

was being exercised. However, in this case identifying a link between the effectuating mind and category formation was not clear as a student would likely have continued to investigate new menus rather than stick to the relevant menu options that allowed them to take advantage of opportunities in the game. Longer term, maybe this behavior would have shown more distinct links to the effectuating mind, however, based on the evidence here the researcher can only suggest that there is a link between the opportunity recognition mind and category formation.

The theme of *instinctual diversification* was identified when students chose to diversify their businesses in the game while being unable to explain why they had made this choice. They were likely relying on previous knowledge to make this decision; however, they also were organizing businesses in the game into groups. They did this in two ways: The first way was to place businesses they had previous knowledge about and avoid businesses they did not have previous knowledge about. The second way was to identify businesses they had already tried out in the game and those that they had not. The researcher does not believe the students were deliberately categorizing the information this way, but based on the behavior that was observed, it seems to be plausible that this was the process they were going through without being aware of it. Since category formation is defined as happening both consciously and unconsciously, a connection seems to be possible between this behavior and category formation. This theme emerged in the designing mind and suggested that category formation was being exercised.

Category formation seems to have an effect on both how entrepreneurs identify opportunities and their strategy on how to exploit these opportunities. Based on the evidence observed in this study, it seems reasonable to connect category formation with the opportunity recognition and designing minds.

Table 5.17

Which entrepreneurial minds are linked with category formation?

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Category for- mation	X	X	-	-	-

5.3.8 Pattern recognition.

As previously discussed in the literature review, **pattern recognition** is defined as identifying similar properties among disparate objects to form patterns that are relevant and useful to the current context by applying previous knowledge.

The theme of *opportunity from focusing on in-game details* was identified when students took advantage of the Consumer Traffic Index (CTI) number that was attached to different locations. This small detail has an impact on the profitability of a business started in the game and the students that focused on this specific detail benefited from their sensitivity to it. The theme of *seeking in-game knowledge* was identified when students searched for crucial aspects that could be taken advantage of. Recognizing similarities between menus and areas of the game interface provided an advantage to the students who realized that a pattern was present with related information and options located in similar locations. While each of the businesses had different properties, menu locations for them were similar and the students that identified this were able to set up their businesses with less difficulty. However, based on their behavior, the students were likely not aware that they were exercising the pattern recognition skill in this way. Due to the limited amount of time and experience they had with the game; quick recognition of these underlying patterns afforded an advantage in the game during the time they were playing. Longer term, the students would have all likely recognized these patterns in the game as they learned

where information was located. While this seems to be a clear application of pattern recognition, it seems like the use of this skill is more short term than long term as the patterns present in the game are learned by the player. Despite this, these themes emerged in the opportunity recognition mind and suggested that pattern recognition was being exercised.

The theme *impact of the game’s user interface* was identified because much of the information was located in different menus, and the game would sometimes force students to choose an action to remediate a situation without the student being aware of the possible consequences. The game’s interface itself was organized through patterns and the students who investigated the different sections of the interface had an increased chance to discern these patterns. Students who had trouble with the interface tended to also have problems making profit in the game, leading to frustration. If anything, the game’s user interface (though it was organized according to a pattern) demonstrated whether a student was exercising this skill or not. The behavior seen under this theme was (more than not) indicative of lacking the skill of pattern recognition.

Pattern recognition seems to have an effect on how entrepreneurs identify opportunities. Based on the evidence observed in this study, it seems reasonable to connect pattern recognition with the opportunity recognition mind.

Table 5.18

Which entrepreneurial minds are linked with pattern recognition?

	Opportunity Recognition Mind	Designing Mind	Risk Management Mind	Resilient Mind	Effectuating Mind
Pattern recognition	X	-	-	-	-

5.4 Summary

The research question of this study was “What cognitive and non-cognitive skills and behaviors relevant to entrepreneurship do students exhibit while playing Capitalism Lab?” In this chapter, the definitions from the literature review of eight non-cognitive skills and eight cognitive skills were examined against the entrepreneurial behavior observed in the results. Based on this examination, a decision was made about a link between the individual skills and specific entrepreneurial minds. While seven of the non-cognitive skills were linked with at least one of the entrepreneurial minds, one was not linked with any of them (social skills). Similarly, while six of the cognitive skills were linked with at least one of the entrepreneurial minds, two were not linked with any of them (multiple simultaneous attention and working memory). The researcher wants to emphasize that this does not necessarily mean a link is not present, merely that it was not observed in this context. These links will be summarized at the beginning of the conclusion in Table 6.1 to examine which cognitive and non-cognitive skills are connected to each entrepreneurial mind to answer the research question.

CHAPTER 6

CONCLUSION

The research question of this study was “What cognitive and non-cognitive skills and behaviors relevant to entrepreneurship do students exhibit while playing Capitalism Lab?” In the literature review, there were four major goals. First, entrepreneurial skills and behaviors were determined. Second, definitions of the cognitive and non-cognitive skills were operationalized since their definitions continue to be problematic in the literature. Third, connections between entrepreneurship skills and individual cognitive and non-cognitive skills were explored. Fourth, it was established that observing both cognitive and non-cognitive skills within a video game environment was a worthwhile approach to study these skills. This pragmatic study involved collecting both qualitative and quantitative data from six Grade 11 and 12 students from a single location played the game. Students completed a survey, played Capitalism Lab for around thirty minutes, and then were interviewed about their experiences in-game. Video of the gameplay was recorded, and the interviews were transcribed for future analysis. This study design allowed for identification of cognitive and non-cognitive skills utilized by students during gameplay and their relationship to entrepreneurial behaviors. Following an analysis of video game footage and interview transcripts, entrepreneurial behavior was identified across the group of six students as they played Capitalism Lab. As the results were reported, common application of skills was identified under specific themes (detailed in Table 4.6) related to each entrepreneurial mind. In the discussion, the behavior from the results was examined against the definitions of the individual cognitive and non-cognitive skills to identify any relationships between specific cognitive and non-cognitive skills and the entrepreneurial minds. Table 6.1 below summarizes the discussion.

Table 6.1*Which entrepreneurial minds are linked with cognitive and non-cognitive skills?*

	Opportunity Recognition Mind	Designing Mind	Risk Man- agement Mind	Resilient Mind	Effectuating Mind
Persever- ance/grit	-	-	-	X	X
Self-control	-	-	X	X	-
Social skills	-	-	-	-	-
Resilience and coping	-	X	X	X	X
Self-perception	-	X	-	-	X
Creativity	X	-	-	-	-
Metacognition	X	X	-	-	-
Motivation	X	-	-	X	X
Sustained at- tention	X	-	-	-	X
Response inhi- bition	-	X	-	X	X
Speed of infor- mation pro- cessing	X	X	-	X	-
Cognitive flex- ibility and con- trol	-	-	-	X	X
Multiple sim- ultaneous at- tention	-	-	-	-	-
Working memory	-	-	-	-	-
Category for- mation	X	X	-	-	-
Pattern recog- nition	X	-	-	-	-

Table 6.1 shows a summary of the entrepreneurial minds and which cognitive and non-cognitive skills are linked to each of them. The **opportunity recognition mind** was linked with creativity, metacognition, motivation, sustained attention, speed of information processing, category formation, and pattern recognition. The **designing mind** was linked with resilience and coping, self-perception, metacognition, response inhibition, speed of information processing, and category formation. The **risk management mind** was linked with both self-control and resilience and coping. The **resilient mind** was linked with perseverance/grit, self-control, resilience and coping, motivation, response inhibition, speed of information processing, and cognitive flexibility and control. The **effectuating mind** was linked with perseverance/grit, resilience and coping, self-perception, motivation, sustained attention, response inhibition, and cognitive flexibility and control. Based on the evidence gathered in this study, several of the cognitive and non-cognitive skills (social skills, multiple simultaneous attention and working memory) were not linked to any of the entrepreneurial minds. This does not necessarily mean a link does not exist, but that there was not enough evidence to indicate a potential connection. The non-cognitive skill of resilience and coping was most commonly linked to the entrepreneurial minds, which could be an indication of which non-cognitive skill is most important to entrepreneurship. The cognitive skills of response inhibition and speed of information processing were most commonly linked to the entrepreneurial minds, which could be an indication of which cognitive skills are most important to entrepreneurship.

There is also the potential for research into links between these entrepreneurial minds and improved clarity on what each of these minds indicate for entrepreneurship. For example, the resilient and effectuating minds may have a deeper connection to entrepreneurship than the opportunity recognition mind and the risk management mind. It may be more important for the

entrepreneur to act and resist emotional reactions regarding failure than wait for the perfect opportunity. As actions are taken, the opportunity itself could become more distinct or new directions may become evident. Perseverance/grit, resilience and coping, motivation, response inhibition, and cognitive flexibility and control were found under both the resilient and effectuating minds while the opportunity recognition mind and resilient mind shared only motivation and speed of information processing. Perhaps the resilient and effectuating minds should be condensed into a single entrepreneurial mind and become known as the dedicated mind, where the entrepreneur continues to pursue action regardless of setbacks (the specific setbacks they might encounter would be specific to their entrepreneurial endeavor and the opportunity). While the existence of the dedicated mind is speculative, investigating the connections between entrepreneurial minds through cognitive and non-cognitive skills continues to be a worthy avenue for future research.

Because of the dearth of literature on the specific skills belonging to each entrepreneurial minds and variance amongst the definitions of the skills investigated in this study, the definitions of each cognitive and non-cognitive skill had to be operationalized to perform the study. Therefore, a secondary contribution of this research is that an attempt was made to clarify the definitions of many of these cognitive and non-cognitive skills (the eight selected non-cognitive skills and the eight selected cognitive skills) and use them in an empirical study. However, it is important to acknowledge that researchers continue to grapple with which cognitive and non-cognitive skills are even worthy of investigation for entrepreneurship, let alone how each of them is defined.

6.1 Skills Unconnected Under Specific Minds

Even though there were some skills (social skills, multiple simultaneous attention, and working memory) that were not attributed to specific minds during this study, it does not necessarily mean that these skills are unimportant for entrepreneurship or that they would not be observed as related to entrepreneurship under a different context.

As previously discussed in the literature review, Welsh and Bierman (1998) define **social skills** as “an individual’s knowledge of and ability to use appropriate social behaviors that are pleasing to others in interpersonal situations” (p. 7). The non-cognitive skill of social skills was not observed, likely due to the way it is defined. Furthermore, it is unsurprising that social skills was unrepresented in the data since the students were not observed in interpersonal situations and were interacting with the game, which led to this skill being unrepresented in the data. Even so, research by Baron and Markman (2000, 2003) *does* indicate a link between social skills and entrepreneurship.

Multiple simultaneous attention is defined as the ability to direct attention towards, re-direct attention between and complete two or more tasks at the same time. **Working memory** is defined as the ability to direct attention to keep, process and use information in a short period of time to perform tasks. The participants applied these skills as needed in a wide variety of situations, particularly as they were getting started in the game. While both skills were observed suggesting a possible link to entrepreneurship, attributing either of them to specific entrepreneurial minds was implausible given the lack of evidence. There was also a significant lack of research on the connection of these skills to entrepreneurship in the literature review.

Interestingly, two important avenues for future research emerged. First, investigating whether the cognitive skill of multiple simultaneous attention is better conceptualized as repeatedly applied working memory or parallel channels of working memory would be interesting.

Second, the definition of multiple simultaneous attention implies utilization of working memory, so more research into how these skills are defined and used would be valuable. The lack of connection between social skills and entrepreneurial skills was not a surprise given the context of this study. It is likely that given a different context with more interpersonal interaction (for example, while students played a board game or a couch co-op video game) or perhaps an online multiplayer environment, social skills would be linked with several of the entrepreneurial minds. In fact, the researcher expects that a link would emerge as entrepreneurship involves interaction between groups of humans. Again, another possible direction for future research in this area would be to demonstrate this expected link.

Although some characteristics were unconnected to the five minds, many were. The following sections summarize these connections. However, it is important to be mindful that no attempt was made to establish a hierarchy or to quantify the relationship that each of the connected skills contributed to each overall mind. Additionally, the researcher wants to clarify that the behaviors observed related to each mind were the net result of both the selective and collective application of these skills (i.e., multiple skills might be utilized simultaneously for a single, specific behavior) within the game Capitalism Lab. In a different context or with different initial conditions (but the same video game), different skills could be observed.

6.2 Skills Related to the Opportunity Recognition Mind

The opportunity recognition mind was linked to three non-cognitive skills and four cognitive skills (discussed below). This is somewhat unexpected as nearly half of the non-cognitive skills and half of the cognitive skills appear to contribute to entrepreneurs recognizing opportunities. Based on this, recognizing opportunities seems to be a complex process.

6.2.1 Non-cognitive skills

The opportunity recognition mind was linked to the three non-cognitive skills of creativity, metacognition, and motivation. As previously discussed in the literature review, **creativity** is defined using Plucker et al.'s (2004) definition with a slight modification, as the production of a product, *plan, or service* that is novel and useful in a social context, based on an individual or group's aptitudes, processes and operating environment. **Metacognition** is defined as the knowledge of and ability to regulate and monitor one's own cognitive processes before, during and after tasks. **Motivation** is defined as the performance of an activity for either the inherent pleasure or an external reward that results from performing the activity.

This combination of creativity, metacognition and motivation was interesting. The combination of these three skills under the opportunity recognition mind seems to reinforce how entrepreneurs behave as they pursue entrepreneurship. This supports research from Ibrahim and Soufani (2002) that entrepreneurs need to be creative with identifying profitable opportunities that could exist, though those opportunities may not have been realized at the current time. The relationship between creativity and opportunity recognition contributes to supplementing Fillis and Rentschler's (2010) view that a competitive advantage exists for entrepreneurs who are creative. Estay, Durrieu, and Akhter (2013) argue that motivation in entrepreneurs depends on linking behaviors to tangible results (such as increasing profit or reducing expenditures) while being moderated by the entrepreneur's expectation of rewards for their behaviors. It seems clear that the motivation behind behavior drives the entrepreneur toward their expectation of results as they go through the opportunity recognition process.

The relationship between metacognition and opportunity recognition supports Cox's (2016) work. It also supports Ward's (2004) conclusion that the entrepreneur "must generate valuable ideas for new goods or services that will appeal to some identifiable market, and having

identified those potential opportunities, [the entrepreneur] must figure out how to bring the project to fruition” (p. 174). This further supports research by Fillion (1999) that entrepreneurs must be aware of their own cognitive processes as they consider how to exploit a specific opportunity through the whole process of entrepreneurship, while remaining motivated enough to pursue action towards actualizing the benefits of exploiting that opportunity. For example, spending time exploiting one opportunity may have unintended consequences for the business if that time could have been utilized on other activities. How these skills influence each other remains up for debate, but the combination of creativity, metacognition and motivation seems to contribute to opportunity recognition.

6.2.2 Cognitive skills

The opportunity recognition mind was linked to the four cognitive skills of sustained attention, speed of information processing, category formation, and pattern recognition. As previously discussed in the literature review, **sustained attention** is defined as the ability to examine, focus on and think about tasks over a period of time based on the context of the task and motivation for completing it. **Speed of information processing** is defined in the literature review as how quickly a learner can process new information and act upon it. **Category formation** is defined as the ability to organize information, concepts, and skills into categories either unconsciously or through a deliberate process in order to simplify processing of stimuli in the environment. Finally, **pattern recognition** is defined as identifying similar properties among disparate objects to form patterns that are relevant and useful to the current context by applying previous knowledge.

These four skills and their relationship to entrepreneurship was thought-provoking and rational. Sustained attention seems to be necessary for entrepreneurs who seek opportunities,

because they not only need to realize that the opportunity exists but also must make a judgement as to whether the opportunity could be profitable enough to pursue further. For example, to whom should the entrepreneur try to market their product or service? Selecting the correct group can have direct consequences for the business. This is corroborated by Gifford's (1992) argument that entrepreneurial attention must be focused on the information that is important, while filtering out the unnecessary information. Following a review of the impact of Bird's (1988) work, West and Dickson (2018) concluded that entrepreneurial intent is important for opportunity recognition, of which sustained attention is a component. The findings here support West and Dickson's (2018) viewpoint. Both category formation and pattern recognition appear to be integrated with opportunity recognition. Finding that both category formation and pattern recognition are related to opportunity recognition agrees with both Baron and Ensley's (2006) and Hisrich, Langan-Fox, and Grant's (2007) work. For example, a profitable business idea in one geographic region could be adapted or replicated in either a physical region where this business does not exist or to function within a digital environment. Recognizing and categorizing information into patterns may help to reveal opportunities that were not obvious at first glance. Finally, speed of information processing seems relevant as well, given that if the information can be processed quickly then a judgement can be made about whether the opportunity is profitable and achievable. This corroborates Vaghely and Julien's (2010) conclusion that speed of information processing is linked with opportunity recognition. Slower processing of information by one entrepreneur may allow another potential entrepreneur to bring an idea to fruition earlier, resulting in an advantage for the one with a faster speed of information processing skill. The race to produce an effective COVID-19 vaccine (as the group that produces a safe one the quickest will likely profit the most), is a notable example.

6.3 Skills Related to the Designing Mind

The designing mind was linked to three non-cognitive skills and three cognitive skills. It is a complex process for entrepreneurs to design solutions to problems, with nearly half of the cognitive and non-cognitive skills being applied to perform this process.

6.3.1 Non-cognitive skills

The designing mind was linked to the three non-cognitive skills of resilience and coping, self-perception, and metacognition. To review, the non-cognitive skill of **resilience and coping** is defined as the management of emotions during the process of adapting to challenging circumstances while working to complete difficult tasks. **Self-perception** is defined as a person's concept of their own abilities and beliefs about their own capability to influence their circumstances. **Metacognition** is defined as the knowledge of and ability to regulate and monitor one's own cognitive processes before, during and after tasks.

The combination of these three skills is somewhat unexpected at first glance. However, Bandura's (1993) work on self-efficacy indicates a connection between self-efficacy, resilience and coping, and motivation. These three skills being connected within a single entrepreneurial mind supports his work. Self-perception seems important to applying one's own abilities to initially design a product or strategy. If a person's self-perception of their own abilities is poor, then it is unlikely the individual would exert additional thought and effort in figuring out how to design a solution to a problem. This supports Bandura's (1994) theory that "people with high assurance in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided" (p. 1). If a person's self-perception is accurate, they should know whether they have the skills to tackle the problem or need to seek additional outside help from others. Self-perception seems to be crucial to planning as an entrepreneur as it would be important for

the entrepreneur to know whether they should do a part of the job themselves or attempt to hire someone else to take care of a specific aspect. If their self-perception is inaccurate, the consequences for the entrepreneur could be severe as efficiency could be decreased, increasing the costs associated with that section of the business.

While self-perception seems to fit the designing mind well at first glance, resilience and coping along with metacognition require more examination. Both metacognition and resilience and coping require self-monitoring and discipline. These skills work together to allow the student to examine a problem, keep themselves calm and design a solution, then move towards implementing that solution and adjusting their behavior along the way. Based on this, all three of these skills seem to be necessary for the designing mind. However, the finding that metacognition is utilized in the designing mind contradicts previous research by Mukherji, Mukherji and Hurtado (2012) which states that metacognition is only related to the entrepreneur taking action (which would be the effectuating mind, rather than the designing mind). So there seems to be room for further research into the relationship between metacognition and the designing mind. Interestingly, metacognition being related to entrepreneurship supports Haynie's (2005) work that metacognition was connected to entrepreneurship, but at the same time, the relationship between metacognition and cognitive flexibility and control in Haynie's work was not found under this entrepreneurial mind.

6.3.2 Cognitive skills

The designing mind was linked to the three cognitive skills of response inhibition, speed of information processing, and category formation. From the literature review, **response inhibition** is defined as the ability to prevent or stop one's own response to distractions. **Speed of information processing** is defined as how quickly a learner can process new information and act

upon it. **Category formation** is defined as the ability to organize information, concepts, and skills into categories either unconsciously or through a deliberate process in order to simplify processing of stimuli in the environment.

Thinking about what type of behavior is encompassed by the designing mind, it seems logical that both category formation and speed of information processing would be observed in this mind. However, it is somewhat surprising to see links between the designing mind and response inhibition. To explain these connections, category formation helps the entrepreneur break down a complex problem into smaller pieces. Though limited connections between category formation and entrepreneurship were discussed in the literature review, the connection found here is reasonable. Speed of information processing helps to quickly analyze information, which results in the creation of a plan to solve the problem. The quicker the plan is created; the sooner action can be taken towards implementing the potential solution. Admittedly, speed of information processing may be more of a short-term skill than long-term skill. Vaghely and Julien (2010) indicate a connection between opportunity recognition and speed of information processing, which is somewhat supported here as the designing mind would help the entrepreneur determine their next step to take advantage of the opportunity. The link to response inhibition emerges based on the individual's ability to focus on the elements that are or will be critical to the plan that is being created and carry it through to implementation. The more thorough the considerations of a plan are, the easier it will likely be to implement. Distractions may hinder the ability to focus on the creation of the plan, which could result in a suboptimal solution or failure.

6.4 Skills Related to the Risk Management Mind

The risk management mind was linked to two non-cognitive skills while no links to any of the cognitive skills were observed in this study. This is somewhat surprising as not many

skills seemed to be linked to the risk management mind. Risk management appears to be relatively uncomplicated compared to the previously discussed opportunity recognition and designing minds. As will be discussed here, it is possible the links between non-cognitive skills and the risk management mind are not as simple as they seem to be at first glance.

6.4.1 Non-cognitive skills

The risk management mind was linked to the two non-cognitive skills of self-control and resilience and coping. Baumeister, Vohs, and Tice, (2007) define **self-control** as the “capacity for altering one’s own responses, especially to bring them into line with standards such as ideals, values, morals and social expectations, and to support the pursuit of long-term goals” (p. 5). The non-cognitive skill of **resilience and coping** is defined as the management of emotions during the process of adapting to challenging circumstances while working to complete difficult tasks.

There is a logical connection between the risk management mind and both self-control and resilience and coping. Korber and McNaughton (2018) also found links between resilience and risk mitigation. Both self-control and resilience and coping allow a logical response (i.e., avoiding a knee-jerk reaction) to changing circumstances that could induce challenging emotional responses for the entrepreneur. Since the process of entrepreneurship has several phases and the entrepreneur would be well advised to have a goal to work towards, risk management is key to achieving this goal. In a business environment, especially at the beginning of a new venture, controlling/limiting spending (by exercising self-control) to only the absolute necessities would allow the initial capital to stretch a bit further, potentially influencing the success or failure of the venture. Furthermore, utilizing resilience and coping to work through the challenges would also help to mitigate the risk involved with starting an entrepreneurial enterprise. This is corroborated by research from Corner, Pavlovich, and Singh (2017) on how entrepreneurs cope

following the failure of an entrepreneurial venture. At the very least, exercising both skills would afford the business the ability to resist more stresses as capital is only spent when necessary.

6.4.2 Cognitive skills

The risk management mind was not linked to any of the cognitive skills based on the observations made in this study. While counterintuitive, the researcher believes there are two possibilities that may explain this. First, it is possible that there were difficulties in observing cognitive and non-cognitive skills caused by the study design. The behavior that was classified as falling under the risk management mind could have been more heavily identified within other minds and thus end up being classified under those minds rather than the risk management mind. Such a classification issue would also have led to difficulties identifying specific cognitive skills that related to the risk management mind as they would have been attributed to a different mind instead. Observing and classifying a link between the first mind where the skill was observed instead of a link to the risk management mind was potentially missed when it was possible that the cognitive skill being observed was related to both minds. A second reason for the lack of connections is that it is possible that since the students were just learning to play the game, they did not perceive any real risk to themselves in this context. It would be difficult for the participants to manage risk when unsure about what the risks are, especially in a relatively risk-free environment (i.e., the safety of the school environment, fake money in the game, it was a private performance, etc.). The only real risk to the students was that they could lose at the game and need to restart it; ultimately, there would be no significant impact on their lives outside of the study. Such circumstances might have led to a more carefree attitude towards the gameplay. While the video game context was effective for observing behavior and skills in a low-risk environment, entrepreneurship in the real world can have significant risks that may affect performance. It is

also possible that the students were concerned with learning the game rather than managing risk. For this reason, they may have focused on *failing forward* to see what worked in the game and what failed. It would be interesting to see students play a game with which they had more experience to examine if more behavior related to the risk management mind emerged.

It is likely that a combination of these two scenarios contributed to the lack of identification of any cognitive skills being linked with the risk management mind. The first scenario could be studied by being more specific about behaviors that constitute risk management or focusing the investigation only on a specific mind (so that a behaviour wouldn't have been misattributed to a different mind as the connection is more obvious). The second situation could be investigated by giving the participants a monetary reward and then removing some of that reward based on performance in the game. Both scenarios represent opportunities for future study. There were also two cognitive skills (multiple simultaneous attention and working memory) that were not linked to any of the minds, described earlier in this conclusion. Perhaps there are links between the risk management mind and multiple simultaneous attention/working memory that were not present in this context.

6.5 Skills Related to the Resilient Mind

The resilient mind was linked to four non-cognitive skills and three cognitive skills. Nearly half of the cognitive skills and half of the non-cognitive skills seem to contribute to the resiliency of the entrepreneur. Based on the results found here, resiliency appears to be a complex process.

6.5.1 Non-cognitive skills

The resilient mind was linked to the four non-cognitive skills of perseverance/grit, self-control, resilience and coping, and motivation. Shechtman et al. (2013) define **perseverance/grit**

as pursuing “long term or higher order goals in the face of challenges and setbacks, engaging the student’s psychological resources, such as their academic mind sets, effortful control, and strategies and tactics” (p. 3). In addition, Baumeister, Vohs, and Tice, (2007) define **self-control** as the “capacity for altering one’s own responses, especially to bring them into line with standards such as ideals, values, morals and social expectations, and to support the pursuit of long-term goals” (p. 5). The non-cognitive skill of **resilience and coping** is defined as the management of emotions during the process of adapting to challenging circumstances while working to complete difficult tasks. Also previously discussed in the literature review, **motivation** is defined as the performance of an activity for either the inherent pleasure or an external reward that results from performing the activity.

Both perseverance/grit and resilience and coping have obvious links to the resilient mind. Pursuing goals in the face of setbacks and bouncing back from adversity are necessary for entrepreneurs and the resilient mind exemplifies this. While this connection was not surprising, it is good to confirm that both skills were observed. This link is supported by previous work done by Arco-Tirado, Bojica, Fernandez-Martin, & Hoyle (2019) on the relationship between grit and entrepreneurship. It also supports Duchek’s (2018) study linking entrepreneurship and resilience and Corner, Pavlovich, and Singh’s (2017) work on entrepreneurial coping.

The link to motivation is more subtle because the resilient mind seems to be only necessary to the entrepreneur when adversity is encountered. It seems like the motivation that would initially drive any type of entrepreneurial behavior may also be enough to bounce back from challenges. The specific motivation for each individual entrepreneur is as unique as the businesses they begin. The initial goal that drives an entrepreneur to start a business may or may not sustain motivation in the face of adversity. For example, an entrepreneur may have a specific

reason that is enough to initially motivate behavior but not enough to recuperate from problems. In this case, motivation would not be connected to resiliency. Estay, Durrieu, and Akhter (2013) argue that motivation in entrepreneurs depends on linking behaviors to tangible results and expectations, which implies that the results and their expectations affect their resilience. If, motivation both drives initial behavior *and* bouncing back from problems, it is likely connected to resiliency. While motivation seems to play a role in resiliency, some types of motivation may be more influential with initial behavior and other types of motivation may be more crucial for recovering from setbacks. Looking into this in more detail would be enlightening in future research.

The link to self-control is perhaps the most interesting. At the basic level, keeping one's behavior under control supports the other three skills linked to the resilient mind. Geldhof et al. (2014) and Aditya (2020) also indicate that self-control and entrepreneurial intent are linked. As such, new questions emerge: Is self-control linked directly to the resilient mind? Does exercising other non-cognitive skills related to the resilient mind also demonstrate self-control simultaneously? Or is self-control perhaps more fundamental to entrepreneurship than motivation, perseverance/grit and resilience and coping? This is an interesting avenue for future research.

The findings here are corroborated by previous work by Korber and McNaughton (2018) who also found links between resilience and coping ability, risk mitigation, self-efficacy, optimism, adaptive capacity, and persistence. Similarly, Lee and Wang (2017) also identified links between entrepreneurial resilience and other traits/skills including: self-efficacy, motivation, and persistence.

6.5.2 Cognitive skills

The resilient mind was linked to the three cognitive skills of response inhibition, speed of information processing, and cognitive flexibility and control. **Response inhibition** is defined as the ability to prevent or stop a response to distractions. **Speed of information processing** is defined as how quickly a learner can process new information and act upon it. Finally, **cognitive flexibility and control** is defined as the ability to quickly redirect cognitive resources to approach a new situation.

In this study, response inhibition is important to the resilient mind. This connection also seems quite logical: when resiliency is required, limiting negative responses to the situation may allow the individual to reduce their stress and make better decisions. Limiting this negative response would be incredibly important to implementing an effective response to a trying situation. As the situation develops, remaining focused on solving the problem while filtering out distractions is important for working through these difficult situations where resiliency is required. This agrees with Shepherd's (2004) view of entrepreneurs managing their emotional response to focus on the problem at hand.

Speed of information processing is important for bouncing back from adversity. The faster the individual can evaluate the situation and act upon it, the sooner they can begin to make progress to remediate a negative situation. Speed of information processing will also allow the individual to adapt more quickly as situations change. While this ability to adapt is important at the beginning of responding to a situation requiring resiliency, it seems unlikely that speed of information processing would be the skill that carries the entrepreneur through the situation. Response inhibition likely plays an important, sustained role in a resilient response. As an example, a firefighter may recognize that a situation is dangerous and how quickly (speed of information

processing) they do this would be important, suppressing panic (response inhibition) as they work through the situation as it evolves would possibly be the more influential skill.

The skill of cognitive flexibility and control is important for resiliency; however, it is likely less important than both speed of information processing and response inhibition. Haynie's (2005) work also posits a relationship between cognitive flexibility and control and entrepreneurship. Yet, the relationship between metacognition and cognitive flexibility and control in Haynie's work was *not* found under this entrepreneurial mind. Recognizing when a situation is changing requires consistent application of cognitive resources. This flexibility can help the entrepreneur to act on the situation more quickly. Used in conjunction with speed of information processing and response inhibition, cognitive flexibility and control allows the entrepreneur to regulate their emotional response to a negative situation and adjust their behavior, as necessary. One might ask if cognitive flexibility and control could be applied in combination with speed of information processing and response inhibition. This would be an interesting avenue for future research into the cognitive skills related to the resilient mind.

6.6 Skills Related to the Effectuating Mind

The effectuating mind was linked to four non-cognitive skills and three cognitive skills. This is somewhat surprising as nearly half of the cognitive skills and half of the non-cognitive skills appear to contribute to entrepreneurs taking action in the face of uncertainty. Based on this, the effectuating mind seems to involve complex application of cognitive and non-cognitive skills.

6.6.1 Non-cognitive skills

The effectuating mind was linked to the four non-cognitive skills of perseverance/grit, resilience and coping, self-perception, and motivation. To review the definitions, Shechtman et

al. (2013) define **perseverance/ grit** as the pursuit of “long term or higher order goals in the face of challenges and setbacks, engaging the student’s psychological resources, such as their academic mind sets, effortful control, and strategies and tactics” (p. 3). The non-cognitive skill of **resilience and coping** is defined as the management of emotions during the process of adapting to challenging circumstances while working to complete difficult tasks. **Self-perception** is defined as a person’s concept of their own abilities and beliefs about their own capability to influence their circumstances. Finally, **motivation** is defined as the performance of an activity for either the inherent pleasure or an external reward that results from performing the activity.

Perseverance/ grit was linked to the effectuating mind. When the environment becomes difficult for the entrepreneur to navigate, perseverance/ grit can help the entrepreneur to push through adverse situations. This supports previous work done by Mooradian, Matzler, Uzelac, & Bauer (2016) who also identified links between grit and entrepreneurial success. Resilience and coping also seems to be linked to the effectuating mind, and there are a lot of similarities between how entrepreneurs would apply resilience and coping and perseverance/ grit simultaneously.

The non-cognitive skill of resiliency and coping, however, is identified as distinct from perseverance/ grit in the literature. Based on these definitions and the evidence seen in this study, perseverance/ grit could be defined as a long-term cognitive skill that drives action while resilience and coping can be defined as a short-term cognitive skill that limits the impact of reacting to circumstances. The non-cognitive skill of resilience and coping involves keeping emotions under control in the moment, while perseverance/ grit involves driving action towards longer-term goals. Additionally, both resilience and coping and perseverance/ grit are skills that allow the entrepreneur to take action to bounce back from negative situations, while perseverance/ grit seems

to also aid the entrepreneur in taking action towards a goal even when times are good. Resilience and coping acts as the short-term skill that allows the entrepreneur to move through these situations, while perseverance/grit is the long-term skill that is required to endure over. In other words, resilience and coping guides the entrepreneur through a challenge that occurs on a single day (short term), while perseverance/grit aids them in handling problems over months or years (long term). Perhaps these two non-cognitive skills include elements of the same core skill exercised in different forms, under slightly different conditions or over different periods of time. Interestingly, Lee and Wang (2017) also identified links between entrepreneurial resilience and persistence. While there is not enough evidence in this study to confirm this hypothesis, it is an interesting avenue for future research as the skills seem quite intertwined.

Self-perception was connected to the effectuating mind. The entrepreneur's belief about their own abilities would drive their actions. Bandura (1994) indicated that those with high perceived self-efficacy (which is related to self-perception) consider difficult problems as motivators (opportunities) rather than insurmountable hurdles. If they perceived their own abilities as strong, then they would be more likely to take action, but if their perception of their own abilities was poor, they would likely avoid action in that area. Self-perception is important because in a real scenario where the entrepreneur knew they lacked the skills, they may hire someone with the necessary skills. For example, an entrepreneur may be performing home renovations; while relatively skilled in carpentry and electrical work, without any plumbing skills they would need to hire a plumber. Although Ceresia and Mendola (2020) also suggest that self-perception is related to entrepreneurial intent, investigating *how* self-perception drives sustained action compared to simply making it more likely for the entrepreneur to simply initiate action would be a good avenue for future research.

Motivation is important to the effectuating mind. The link between motivation and the effectuating mind was expected: taking action towards a goal even when things are uncertain depends on the individual's motivation. Whether this motivation is intrinsic or extrinsic seems to be unimportant. This supports Estay, Durrieu, and Akhter (2013) who indicate that the results desired by the entrepreneur are what drive behaviors towards the goal. Importantly though, motivation is important to the effectuating mind regardless of the entrepreneurial situation. While there are similarities between perseverance/grit and motivation it is possible that perhaps an underlying skill could be driving the behavior. This is similar in the case of perseverance/grit and resilience and coping (above).

It is notable that Korber and McNaughton (2018) also found links between resilience and coping ability, risk mitigation, self-efficacy, optimism, adaptive capacity, and persistence. Teasing out these differences between the non-cognitive skills is also an important avenue of future research.

6.6.2 Cognitive skills

The effectuating mind was linked to the three cognitive skills of sustained attention, response inhibition, and cognitive flexibility and control. As previously discussed in the literature review, **sustained attention** is defined as the ability to examine, focus on and think about tasks over a period of time based on the context of the task and motivation for completing it. **Response inhibition** is defined as the ability to prevent or stop a response to distractions. **Cognitive flexibility and control** is defined as the ability to quickly redirect cognitive resources to approach a new situation.

Sustained attention is important for the effectuating mind, but it does not generate action on its own. Observing this skill as related to the effectuating mind supports Bird's (1988) work

that sustained attention is related to entrepreneurial intent. Sustained attention allows potential action to be directed towards completing a specific task over time, but the action would not happen due to sustained attention. Gifford (1992) indicated that entrepreneurs must select which information to focus their attention on so they can decide on their next action. Both response inhibition and cognitive flexibility and control are related to the effectuating mind, but like sustained attention, are important for staying on task without necessarily driving the initial step to take action towards that task. However, these characteristics are not the primary stimuli for the initiation of actions or the sustainment of an action over time. Interestingly, the relationship between cognitive flexibility and control and entrepreneurship is corroborated by Haynie's (2005) work, yet, the relationship between metacognition and cognitive flexibility and control in Haynie's work was not found under this entrepreneurial mind. However, at a general level, Dheer and Lenartowicz (2019) contend that cognitive flexibility contributes to driving the behavior of an entrepreneur.

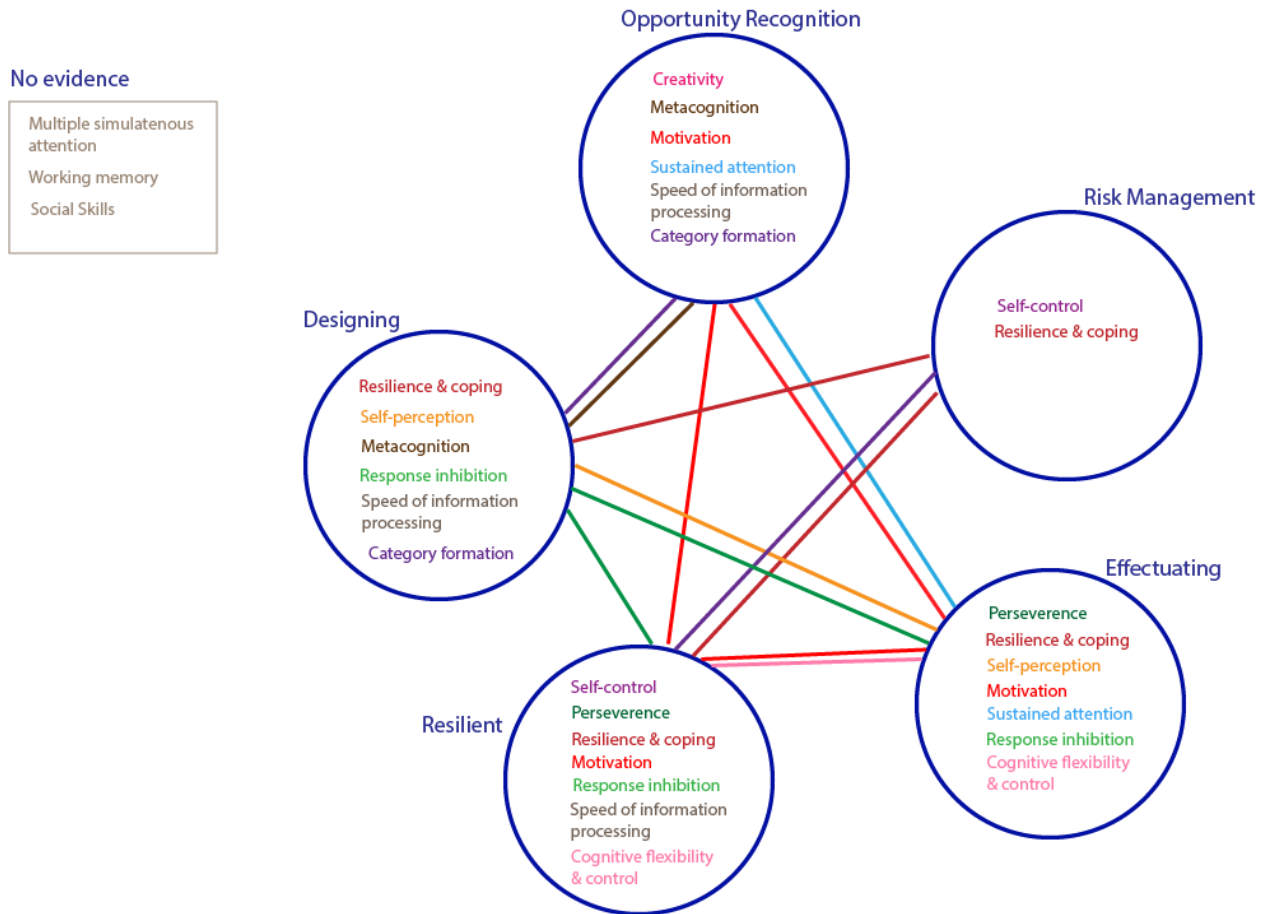
It is somewhat counterintuitive that the cognitive skills may have a *weak* connection to driving action within the effectuating mind yet could support the actions anyways. Give that the connected non-cognitive skills included perseverance/grit, self-perception, and motivation it is logical that the non-cognitive skills drive action within the effectuating mind. Perhaps the connection to the non-cognitive skills was more obvious in the behavior observed during gameplay, while more subtle connections to the cognitive skills were potentially missed. Determining which of these skills are most crucial to the effectuating mind as well as the dependencies between these skills is another avenue for future research.

Overall, there seem to be a substantial number of connections between both cognitive and non-cognitive skills to the entrepreneurial minds. Figure 6.1 provides a visual representation of

the connections between entrepreneurial minds and summarizes the skills relevant to each entrepreneurial mind.

Figure 6.1.

Cognitive and non-cognitive skills related to entrepreneurial minds.



6.7 Additional Contributions of the Research

Table 6.1 summarizes the discussion to answer the research question, linking cognitive and non-cognitive skills with entrepreneurial minds. The links of specific cognitive and non-cognitive skills to each of the five minds by examining behavior within the context of a video game demonstrates the viability of using performance in a video game as a tool to investigate applied cognitive and non-cognitive skills. Throughout the conclusion, specific contributions related to

the entrepreneurial minds and specific skills was discussed. This section details some of the additional contributions of the research in a more general sense.

As this study was completed, one of the first realizations of the researcher was the ambiguity of the definitions for the cognitive and non-cognitive skills as well as terminology related to entrepreneurship. In this study, the new definitions that were operationalized are a research contribution. This study re-emphasized the importance of continuing to research, debate, and discuss the definitions of all these skills and the types of behaviors that characterizes application of them.

This study was organized around investigating a significant number of specific behaviors inside of a specific game context that were considered an application of cognitive/non-cognitive skills. It would be more feasible for future studies like this to focus on a specific mind more deeply. In this way, a researcher could detail more behaviors that relate to a single skill or mind, rather than covering the wide breadth of skills and behaviors investigated in this study. Furthermore, designing a study like this also required the researcher to be familiar with the game originally selected (i.e., Capitalism Lab) since the in-game behaviors needed to be identified in advance. Being familiar with the game may not always be possible for researchers, but it can facilitate the researcher's effort to locate application of these skills in both real and simulated scenarios. Creating scenarios (real or simulated) based on researcher experiences with which participants can interact while applying cognitive and non-cognitive skills would be an effective and viable way to study them.

The creation of entrepreneurial scenarios where students can exercise different cognitive and non-cognitive skills would be a valuable way to pursue teaching entrepreneurship. Scenarios that focused on students effectively applying resiliency and coping, motivation, response

inhibition and speed of information processing to complete them would likely have a significant effect on teaching and learning entrepreneurship processes.

6.8 Additional Avenues for Future Study

More work could be done on clarifying and validating the definitions of the cognitive and non-cognitive skills. In this study, the researcher found that some of the definitions imply use of other cognitive or non-cognitive skills while other definitions tended to share similar qualities (for example, perseverance/grit and resilience and coping). Overlapping definitions, similarities between skills and perhaps a potential hierarchy amongst these skills would help direct future research. This study re-emphasized the importance of continuing to research these skills and how they are defined. Additionally, one might ask if the cognitive/non-cognitive skills that were investigated in this study are the dominant ones? Were some crucial skills for entrepreneurship missed? Investigating other cognitive/non-cognitive skills, their definitions and relation to entrepreneurship would also be a good opportunity for future research.

A major direction for the future would be to alter the game and context of the study. To explain, utilizing a different genre of game, using a different simulation game, altering the amount of time the game was played for, adjusting the parameters of the game, providing specific goals for the players to achieve, orchestrating single player vs. co-op modes, all could have led to different but still interesting results in this type of study. Video games allow observation of complex skills applied individually, interchangeably, and rapidly in a way that models and demonstrates problem solving. Fine tuning the techniques used to observe and elicit cognitive and non-cognitive skills in video gaming would also be another valuable item to research. Due to the wide scope of this study and the lack of current research within the research space of this study, one could argue that further evidence needs to be gathered to support or refute the claimed

links (or lack thereof) between cognitive and non-cognitive skills, and entrepreneurial minds made in this study. Notwithstanding, this suggestion does not invalidate the results of this study, but simply recognizes that examining entrepreneurial behavior in this way is relatively unexplored.

In this study, the participants had no prior knowledge of Capitalism Lab. In future studies, it would be worthwhile to conduct research with players who have various levels of prior experience. The researcher suspects that there would be different behaviors that constitute application of cognitive/non-cognitive skills (from the researcher's side) if the player were more experienced with the specific game utilized. Hence, one might ask how player experience with the video influences which cognitive/non-cognitive skills are applied. Additionally, some behaviors could become routine amongst the experienced players without overt intentionality.

Importantly, this study raises several essential questions that could direct long-term research directions. Could video games be used to improve the cognitive/non-cognitive skills relevant to entrepreneurship? Do video games have a negative effect on the cognitive/non-cognitive skills related to entrepreneurship? Are the skills relevant to entrepreneurship applied in this context transferable to other contexts?

6.9 Summary

In conclusion, skill areas that are considered crucial to entrepreneurship seem to be combinations of simultaneously applied cognitive/non-cognitive skills. Although some ambiguity remains with regard to the definitions of these cognitive and non-cognitive skills, both cognitive and non-cognitive skills play an important role in entrepreneurial behavior. The importance of resiliency and coping, motivation, response inhibition and speed of information processing to entrepreneurial behavior was underscored in this study. Continuing to investigate how these

cognitive and non-cognitive skills relate to entrepreneurship will be important for the development of educational programs that assist entrepreneurs at different stages of the entrepreneurial process. Better knowledge of the crucial skills for entrepreneurship will allow our society to improve entrepreneurial education programs and, by extension, hopefully improve entrepreneurial results for those who pursue entrepreneurship.

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APPENDICES

Appendix A

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Permission for this thesis to use the image was obtained on October 15, 2018 via email. Permission was granted to use Table 1 from Gutman & Schoon's (2013) report with a citation.

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Email confirmation of permission to use was received on October 15th, 2018.

Hi Daniel,

Thank you for getting in touch with the EEF, and for your interest in our report. Please do go ahead and use the graphic, as long as you reference us.

If you have any further questions please get in touch.

Kind regards,
Amy

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Appendix B

Semi Structured Interview Questions

These questions were generated to align with the five minds framework. The exact order, wording and structure of the questions may vary depending upon how each interview develops. There may also be additional questions asked by the interviewer, depending on the responses of the interviewee. The specific cognitive and non-cognitive skills that the students apply are not included here, but are identified in the literature review.

Initial Questions (IQ)

- Tell me how you became oriented within the game.
- Tell me how you decided what to do first in the game.
- What were your initial thoughts about how to make money in the game?

Identifying Opportunities Mind (IOQ)

- How did you choose to sell a specific product or group of products?
 - What information in the game did you take into account as you made this decision?
- How did you decide to place your business in specific locations?
- How did you decide which product to sell?
- How did you decide which type of business to start?
- How did you decide where to build a new business?
- Did you decide to get involved in the stock market of the game?
 - What influenced your decision here?
- Was there anything in the game you noticed you could take advantage of to earn more profit?

- Describe how you felt when the computer had no market share of a product you were going to sell.

Designing Mind (DMQ)

- Did you have a strategy in mind for the game when you first started?
 - Explain what your short-term strategy in the game was at the start.
 - Explain what your long-term strategy in the game was at the start.
- How did your strategy change as you played the game?
- Can you describe your personal goal in the game?
 - How did your goal change as you played?
- How did you decide which types of business to build?
 - You focused on making (specific type) of stores, why?
 - You built a lot of different types of businesses, why?
- If you could have continued to play the game, what would your long-term plan have been in the game?

Risk Managing Mind (RMQ)

- Did you feel like you were taking a risk when you started a business?
 - Did you have a backup plan if it would not have worked out?
- How did you decide to sell a product that the computer was already selling?
- How did you decide to avoid selling a product that the computer was already selling?
- How did you decide when to move into selling another group of products? Why?
- After you played for a while, what changed about your strategy in the game?
- Did you avoid starting a certain type of business? How come?

- Which was more important to you: land cost or customer price index when placing a business?
 - Were you taking this into account at all? Why or why not?
- Did you feel like any of the businesses you started were more likely to fail than others?
 - What about more likely to succeed? Why do you think that was the case?

Resilient Mind (RSQ)

- When something in the game did not work the way you thought it should, how did you adjust your gameplay?
- When a business was losing money, what was your plan or how did your plan change?
- When a business was not making as much money as you thought it should have, what was your plan or how did your plan change?
- Were you confident your businesses would be successful or worried they would fail?
 - Why or why not?
 - Was this related to a specific type of business?
- Were you frustrated with anything while you played the game?
 - How did you cope with this frustration?
 - Why do you think you did not get frustrated?
- Did any of your businesses fail?
 - Why do you think it failed?
 - What did you do to ensure it did not fail?
 - What did you change about your strategy when a business was losing money?
- Describe how you felt when the computer was making more money than you while selling a specific product.

- Describe how you felt when the computer had more market share of specific products than you did.
- When you did not know how to do something in the game, what was your gut reaction?
- What was your strategy to stay ahead or catch up to the computer players?

Effectuating Mind (EMQ)

- How did you feel as you created businesses?
 - Did you feel like you always needed to create more businesses or were you satisfied with the ones you had? Can you explain this?
- Can you describe your thinking when you got low on cash?
- Did you have wait to generate cash? Or did you take out loans?
 - Explain your thinking on waiting to generate cash.
 - Explain your thinking on taking out loans.
- Was your profit increasing, decreasing or stable? Did this fluctuate much?
 - What did you think you needed to do next in the game when your profit was increasing?
 - What did you think you needed to do next in the game when your profit was stable?
 - What did you think you needed to do next in the game when your profit was decreasing?
- How many businesses did you build?
 - Did you feel like you built too many, not enough or the right amount of businesses?
 - How did you decide when to expand or stabilize your business?

- Did you ever feel unsure about what to do next as you played the game?
 - Can you give some examples of when this happened?
 - You did not, why do you think that is?
 - Do you think this influenced how well you performed in the game?
- Did you feel confident in your in-game choices as you made them?
 - Why/why not?

Wrap Up Questions (WUQ)

- If you played again...
 - What would you repeat?
 - What would you do differently?
- Were you having fun playing the game?
- Which parts of the game did you find challenging?
- Which parts of the game did you find easy?
- What did you learn about starting a business as you played this game?
- What did you learn about running a business as you played this game?
- Do you see yourself as an entrepreneur in the future? Why or why not?
 - Did you consider this before playing the game?
 - Do you think playing the game influenced your thinking about entrepreneurship?

Appendix C

Video Analysis/Observation Tool

Behaviors within the game to look for that align with the five minds framework will include the following. This list is not comprehensive for all of the potential behaviors that students could perform within the game, but it is a good start to analyzing the video that will be collected later.

The students' gameplay will be saved as well, so there will be a good amount of quantitative data that will be gathered from final gameplay statistics.

Identifying Opportunities Mind (IO)

- When a student selects a product that the computer is not selling. (IO – Computer Not Selling)
- When a student attempts to take advantage of another city to succeed in game. (IO – Another City)
- When students placed businesses that were complementary because of an opportunity (IO – Type of Business)
- When a student made an error that hurt their opportunities (IO – Game Problem)
- When the student places a business in a “high traffic” place. (IO – High Traffic)
- When the student purchases or sells stock in another business. (IO – Buy Stock)
- When a student builds a type of business they have not built before. (IO – New Business Type)
- When a student changed the price of a product to increase profit or market share. (IO – Price)

Designing Mind (DM)

- When a student tried to build a different business. (DM – Business Type)

- When the student decided to train employees at a business. (DM – Training)
- When a student built multiple businesses of the same type. (DM – Same Type of Business)
- When a student built multiple businesses selling the same product. (DM - Same Product)
- When the student built multiple businesses close together. (DM – Close Businesses)
- When the student builds a different type of business than their previous businesses. (DM – Different Business)

Risk Managing Mind (RM)

- When the student attempted to avoid using loans. (RM – Avoid Loans)
- When the student took out bank loans but did not max out their loans. They used less than 60% of their available credit. (RM – Some Loans)
- When the student took out some bank loans but did get close to maxing out their loan. They used more than 60% of their available credit. (RM – Max Loans)
- When the student sold a product that the computer was already selling. (RM – Same Product)
- When the student sold complementary products at one location. (RM – Similar Products)
- When the student built in multiple cities, instead of just one location. (RM – Multiple Cities)
- When the student sold diverse products at one location. (RM – Diverse Products)
- When the student tried to minimize the cost of land when placing a business. (RM – Land Cost)
- When the student tried to sell the same products at different locations. (RM – Multiple Locations, Same Product)

Resilient Mind (RES)

- When the student tried to save a failing business. (RES – Attempt to Save)
- When the student changed the product they were selling because the business was losing money. (RES – Change Product)
- When the student got frustrated with something in the game but continued playing. (RES – Frustration)
- When the student transferred a business that was losing money to being profitable. (RES – Business Profitable)
- When the student attempted to take action when a business is not profitable. (RES – Not Profitable)

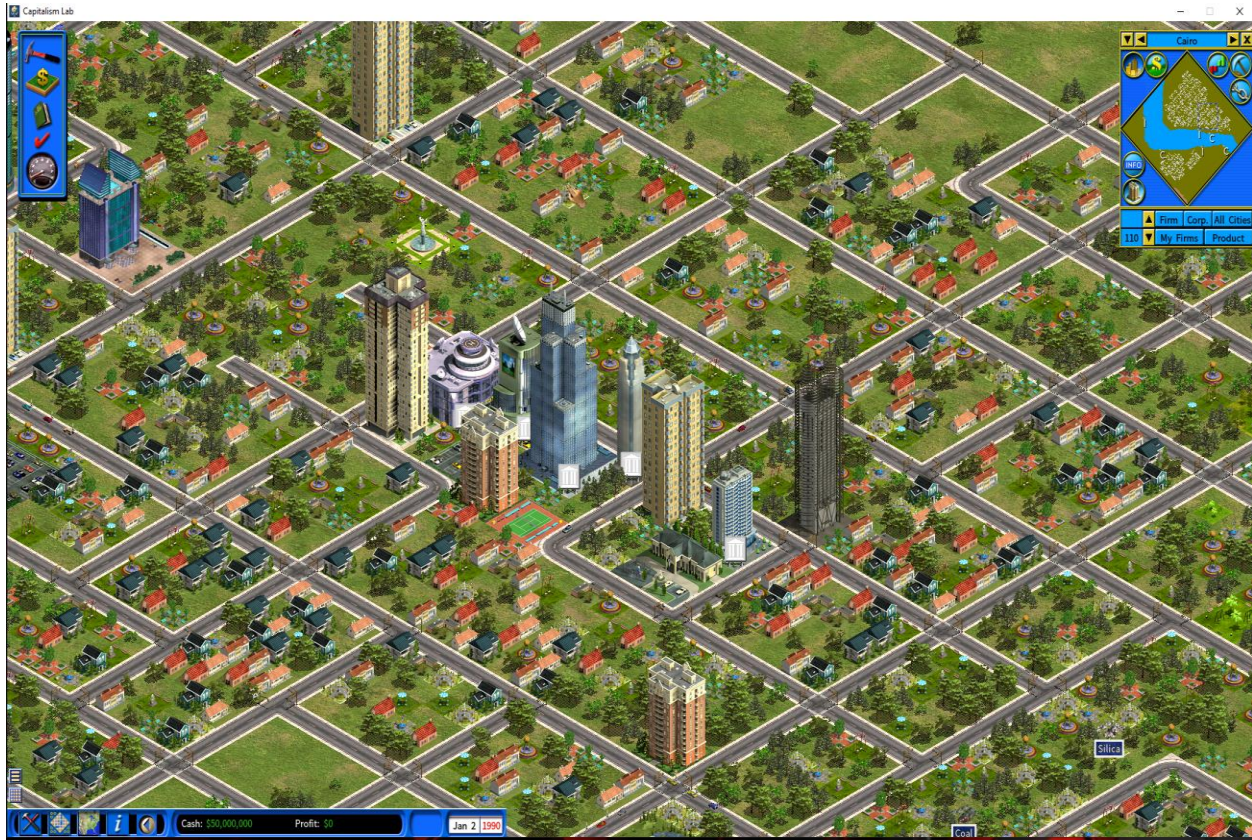
Effectuating Mind (EM)

- When the student took out any amount of bank loans to continue building their businesses. (EM – Loans)
- When the student paused the game to build more businesses. (EM – Pausing)
- When the student sped up the game to earn more money to start more businesses. (EM – Fast Forward)
- When the student attempted to place or adjust a business (EM – Placing Businesses)
- When the student observed clicking the mouse repeatedly. (EM – Consistent Action – Clicking)
- When the student attempted actions toward businesses that were not profitable. (EM – Profitable Activity)

Appendix D

Sample images from Capitalism Lab

This appendix includes several images from Capitalism Lab to illustrate some aspects of the user interface with a brief description of what is depicted in each image.



The above image is the main window of the game. There are menus accessible on the top left of the screen, a map on the top right with different modes that can be toggled, and the small menu in the bottom left that records cash, profit and the date.



The image above features the main window of a department store. This department store is selling beds, cameras and sound systems, with the small window on the bottom right including information about the selected product. The 3x3 grid on the bottom right shows the slots where the products are purchased, inventory is managed, and sales are made.



The image above displays the information that the player gets as they attempt to place a department store, including the Customer Traffic Index (which indicates how many customers would attend the business, abbreviated previously as CTI) and Land cost, among other things.



The image above shows one of the menus from the top left of the main screen where the player can access information about which companies are selling specific products. There is a wealth of other information located in the menu on the left, but in the main area the player can examine the market share and profit for different products.

Hotkey: 'C'

- Corporations
- Corporate Details
- Products
- Product Details
- Firms
- Financials**
- Persons
- Goal
- Score
- Billionaires 100
- Manufacturer's Guide
- Farmer's Guide
- Manager's Guide
- Cities
- Financial Actions

FINANCIAL REPORTS

Corporate Balance Sheet
 Corporate Income Statement

ASSETS	Total (0 year)	YTD Changes	Last Year Changes
Cash	\$50,000,000	\$0	\$0
Inventory	\$0	\$0	\$0
Business Assets	\$0	\$0	\$0
Land and Natural Resources	\$0	\$0	\$0
Intangible Asset: Technology	\$0	\$0	\$0
Stocks	\$0	\$0	\$0
TOTAL	\$50,000,000	\$0	\$0

LIABILITIES	Total (0 year)	YTD Changes	Last Year Changes
Bank Loans	\$0	\$0	\$0
TOTAL	\$0	\$0	\$0

SHAREHOLDER EQUITY	Total (0 year)	YTD Changes	Last Year Changes
Common Stock	\$50,000,000	\$0	\$0
Total Earnings	\$0	\$0	\$0
Total Dividend Paid	\$0	\$0	\$0
TOTAL	\$50,000,000	\$0	\$0

The image above includes the financial information (Balance Sheet and Income Statement) available to the player, as another option from the menu on the left. These sheets keep track of this information automatically so the player can monitor the health of their businesses.



The image above illustrates some of the options available to the player for different types of businesses that can be started.

Permission to use these images.

Hello Dan,

My name is Daniel Krause and I utilized your game (Capitalism Lab) in a master's thesis. I examined the utilization of cognitive and non-cognitive skills related to entrepreneurship as students played your game and was hoping to include images, but would like to request permission to include the images.

We are happy to grant you permission to use the images.

Best
 David Lee
 Marketing Manager
 Enlight Software

Appendix E

Survey questions from Business Development Bank of Canada

This appendix includes the questions asked to determine the level of students' entrepreneurial characteristics and tendencies. The full survey was used with participants in 2019 (with images taken at that time) and was freely available at <https://www.bdc.ca/en/articles-tools/entrepreneur-toolkit/business-assessments/pages/self-assessment-test-your-entrepreneurial-potential.aspx>.

Questions 1-10

	1	2	3	4
1. I like to give myself challenges when I take on a new project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I am fairly at ease in difficult situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Where others see problems, I see possibilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I always worry about what others will think before doing something important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I am fairly curious and I am continually in search of discovery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I am a lot less effective in stressful situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I want to build something that will be recognized publicly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. When faced with difficulties, I look for alternative solutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. For me, what counts is action	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. For me, it is possible to influence one's destiny	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Questions 11-20

	1	2	3	4
11. I am capable of imagining how we can make things work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. When I take on a project I have confidence that I will carry it out successfully	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. I shoot for excellence in everything I do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. According to me, we somehow make our own luck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. In general, I distrust my instincts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. I have no problem working for someone else	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. I try to be the first or the best in my area of competency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. For me, taking risks is like buying a lottery ticket: it's a question of chance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. I am capable of seeing many solutions to a problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. I prefer having the final say	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Questions 21-30

	1	2	3	4
21. I always try to learn lessons from my failures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22. For me, everything is possible if I believe I can do it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. I prefer using the good old ways of doing things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. Success is mostly luck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. A certain level of stress stimulates me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. It is easy for me to motivate others to work with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. I often feel stuck by a difficult situation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28. I can easily imagine many ways to satisfy a need	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29. After a failure, I am able to pick myself up and start over	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30. I am not always ready to make sacrifices in order to succeed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Questions 31-40

	1	2	3	4
31. I don't like to influence others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
32. To be satisfied with myself, I take on easy projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
33. When I take on a project, I am not always convinced that I can carry it out successfully	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
34. I like to lead others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
35. I always try to take calculated risks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
36. I have a hard time functioning in uncertain or ambiguous situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
37. I am always in the midst of launching new projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
38. I have a hard time anticipating events, trends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
39. I really enjoy situations where there are rules to respect	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
40. Today, without a lot of money, we can not take on a whole lot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Questions 41-50

	1	2	3	4
41. Being too ambitious is often perceived poorly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
42. I have a tendency to put off difficult tasks until later	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
43. I am the kind of person to see the glass as half empty instead of half full	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
44. There is a time for thought but action is more important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
45. I am not afraid to take on initiatives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
46. No matter what we do, it doesn't depend on us	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
47. I prefer being my own boss	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
48. I don't consider myself more ambitious than others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
49. I always give the best of myself in everything I do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
50. I manage my stress well in ambiguous and uncertain situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Questions 51-54

51. Age:

25

52. Gender:

- Man
- Woman

53. Have you ever worked for yourself?

- Yes
- No

54. What is your occupation/profession

- Company owner-senior executive
- Upper management
- Salaried position – Part-time
- Agricultural worker or producer
- Student
- Other (specify)
- Self-employed
- Salaried position – Full-time
- Professional
- Mid-level management
- Unemployed